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Aberdeen Proving Ground

MARYLAND

DEVELOPMENT AND PROOF SERVICES

OCO Project No.

58AA 384

CONFIDENTIAL

## DEVELOPMENT AND PROOF SERVICES ABERDEEN PROVING GROUND MARYLAND

AUTHORITY: ORDBG

Mr RHAllen/eh 23 January 1958

#### ACCURACY AND ARMOR DEFEATING EVALUATION OF

SHELL, HEP, 155MM, T152E5 AND T152E6 (U)

#### SEVENTH REPORT ON ORINANCE CORPS PROJECT NO. TA1-5002H

DATES OF TEST: 26, 27, 28 MARCH; 10, 11, 27 APRIL; 4 MAY; 25 JUNE 1957

#### ABSTRACT

#### OBJECTIVE

To determine and compare the accuracy, armor defeating capabilities and effective maximum range of two different designs of Shell, HE?, 155mm.

#### SUMMARY

A number of Shell, HEP, 155mm, inert—and Composition A-3-loaded, were fired to evaluate differences between two designs. Both designs were fired alternately for accuracy, defeat of armor, and maximum range. A comparative panel fragmentation test was conducted with the two designs and the standard HE, MLO7, Shell.

#### CONCLUSIONS

The Shell, HEP, 155mm, T152E5 is superior to Shell, HEP, 155mm, T152E5 in accuracy and armor-defeating qualities.

#### RECOMMEN DATIONS

It is recommended that:

- A. Shell, HEP, 155mm, T152E5 be considered superior to Shell, HEP, 155mm, T152E6 for the defeat of armor.
- B. Consideration be given to redesign of the shell incorporating a point-detonating, mechanical time or VT fuze in combination with a base-detonating fuze for air burst against personnel, in addition to its armor-defeating qualities.
- C. Additional studies be made with the T152E5 Shell for possible employment in the 155mm, Ml, Gun, with respect to maximum range determination, defeat of armor and bunkers, and accuracy up to 2000 yards.
- D. An evaluation of the standard MiAl Charge be made in conjunction with the T152E5 Shell in an attempt to eliminate requirements for a special charge,

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#### I INTRODUCTION

- A. Previous firing of the 155mm, HEP, Shell in the 155mm, ML, Howitzer gave indication of good band engraving with no distortion of the shell body at pressures up to 35,000 psi and an average muzzle velocity of 2300 fps. It was evident from the limited test results that a heavier shell wall as well as a positive means of sealing the base plug were needed.
- B. The two designs fired in this test incorporated the desired modifications to correct the above-mentioned deficiencies. Both designs that were liveloaded were assembled with a BD, T-, Adjustable, Fuze (firing pin was adjustable) which was similar to the standard Fuze, BD, M91A1.

#### II DESCRIPTION OF MATERIEL

- A. Shell, HEP-T, Inert-Loaded, 155mm, T152E5 with Fuze, BD, M91Al, Inert-Loaded, with Live Tracer, Lot PA-E-23878. The thickness of the shell wall was .115-inch to .170-inch at the beginning of the ogive.
- B. Shell, HEP-T, Inert-Loaded, 155mm, T152E6, with Fuze, BD, M91Al, Inert-Loaded, with Live Tracer, Lot PA-E-23879. The thickness of the shell wall was .220-inch to .265-inch at the beginning of the ogive.
- C. Shell, HEP, Composition A-3-Loaded, 155mm, T152E5 with Fuze, BD, T-, Adjustable, Lot PA-E-23880.
- D. Shell, HEP, Composition A-3 Loaded, 155mm, T152E6 with Fuze, BD, T-, Adjustable, Lot PA-E-23881.
- E. Shell, HE, TNT-Loaded, M107, with supplementary charge, with Fuze, PD, M51A5, Lot WC-31-82. This shell was used as a standard between the T152E5 and T152E6 live-loaded shell in maximum range and fragmentation tests.
- F. For photographs of both shell designs with charges see Appendix C, Photograph Nos. B24565 B24566. Also Appendix F, Drawing of Fuze and Shell.

#### III DETAILS OF TEST

#### A. PROCEDURE

- 1. Since the test program consisted of an evaluation between 2 shell designs, the test was divided into 4 phases. These phases were:
  - a. Defeat of armor plate at 400 feet.
  - b. Accuracy determination.
  - c. Defeat of armor plate at 1000 yards.
- d. Maximum range and dispersion. All rounds were fired from a standard field carriage (MLA1).

- 2. The first phase of the test was the defeat of armor plate with live-loaded ammunition at approximately 400 feet. To accomplish this, two 8-inch armor plates were fired at, one set at 0° obliquity and the other at 60° obliquity. When it was found that the 8-inch plate at 0° obliquity could be defeated, firing at the 8-inch plate set at 60° obliquity was started. This plate could not be defeated and a 7-inch plate set at 60° obliquity was substituted. It was possible to defeat this plate. Following the plate firing, several rounds were then fired at a German "King Tiger" tank hull having 6-inch armor arranged at 44° obliquity.
- 3. The second phase of the test was the firing of shell of both designs inert-loaded at a 1000-yard target for the determination of accuracy. Three groups of the T152E5 design and one group of the T152E6 design were fired. During the firing for accuracy the howitzer was kept in alignment by the use of 2 transits which controlled the vertical and horizontal azimuth of the tube.
- 4. The third phase of the test was the setting of armor plate that was defeated at 400 feet at 1000 yards range. All shell in this phase were liveloaded. The 8-inch plate was set at 0° obliquity and the 7-inch plate at 60° obliquity. The shell designs were fired alternately to give a round-by-round comparison. A second German "King Tiger" tank hull was placed at 1300 yards from the muzzle to determine the long-range effect of the HEP shell against armor of this type.
- 5. The fourth phase of the test was to determine the maximum range and dispersion of both shell designs in comparison with Standard, HE, MLO7, 155mm Shell. All rounds were live-loaded and were fired at 45° elevation. The standard, HE, MLO7, Shell were fired first followed by the T152E5 and T152E6 shell.
- 6. In addition to the 4 phases, a panel fragmentation test was conducted utilizing 2 shell of each design and 2 standard Shell, HE, M107. A chemical and metallurgical analysis of the frontal plate of the German "King Tiger" tank hull was also conducted.

#### B. RESULTS

1. The firing of phase a was with live-loaded shell against armor plate at approximately 400 feet from the muzzle of the howitzer. Prior to the firing, the fuzes of 8 of the live-loaded shell, 4 each of T152E5 and T152E6 were adjusted as follows:

NUMBER ADJUSTED	SHELL	LENGTH OF PLUNGER TRAVEL(inches)
2	T152E5	.30
2	T152E5	.45
2	T152E6	. 30
2	T152E6	•45

a. The adjustment was made to determine which length of fuze plunger setting would give the optimum bursting effect when used against armor plate. After setting the fuze manually, a thread setting cement similar to "Iaminac" was poured on the thread of the adjusting screw and permitted to harden prior

to firing. Four of the rounds, 2 of each design, one set at .30-inch and the other at .45-inch, were then fired at a 8-inch plate set at 60° obliquity. Complete spalls resulted from all 4 shell. The remaining 4 shell were set at .30-inch and .45-inch and then fired against a similar 8-inch plate set at 60° obliquity. The hits upon this plate resulted in bulges for both shell designs. Although the bulges were of similar magnitude for both shell, 2 had partial cracks at the base. From these 8 rounds it was determined that a fuze setting of .30-inch plunger travel would produce satisfactory shell performance and all the remaining live-loaded HEP shell of both designs were set accordingly.

- b. Twenty more shell, 10 each of Designs T152E5 and T152E6, were then fired alternately at the 8-inch plate set at 0° obliquity. Of the 20 rounds fired, 6 rounds functioned low order. One of the shell, Round Number Eight, functioned low order, which produced a bulge on the rear of the plate. The other 14 rounds resulted in complete spalls. Ten rounds, 5 of each design, were then fired alternately at a 7-inch plate set at 60° obliquity. All rounds functioned high order and resulted in complete spall. A German "King Tiger" tank hull which had a main front plate, 6-inches thick, set at 44° obliquity, was then fired at to determine the effect of the HEP shell against foreign armor.
- c. The first shell fired, Design T152E5, resulted in a complete spall. The weight of this spall was approximately 87 pounds. See Appendix C, Photograph B-24856. The second shell, Design T152E6, also resulted in a complete spall. This spall was not weighed. The third shell, Design T152E5, struck the junction of the upper and lower glacis plate which was also 6-inches thick. Although the spall was very small compared to the others the entire weld between both plates as well as the welds in the front area were completely fractured. See Appendix C, Photograph B-24582 B-24585.
- 2. The firing of phase b was conducted for accuracy determination. This firing was begun with the T152E5 shell design. Due to the target distance, it was difficult to estimate the proper elevation which would give a good hit. The first round was fired at 32 mils elevation. Five other rounds were fired dropping the elevation each time until a hit occurred. It was noted that during the first few conditioning and sensing rounds the field carriage trails moved rearward until the carriage became firmly fixed in the ground. After this there was no other perceptible movement either laterally or horizontally.
- a. A 10-round series of the T152E5 shell was then fired, which gave a lateral probable error of .27 mils and a vertical probable error of .39 mils. This corrects to a vertical probable error of .13 mils if round 3 and 4 are omitted from the computations. A second 10-round series of the T152E5 shell was then fired, which resulted in a lateral probable error of .32 mils and a vertical probable error of .34 mils. A 10-round group of the T152E6 shell was then fired, which gave a lateral probable error of .34 mils and a vertical probable error of .14 mils. Following the T152E6 Shell, a 5-round group of the T152E5 shell was fired which gave a lateral probable error of .11 mils and a vertical probable error of .31 mils. The vertical probable error corrects to .09 mils if the fifth round fired is omitted from the computations. See Appendix D, Plots of Target Accuracy.

- 3. For the third phase, phase c, the armor plates that were defeated at approximately 400 feet were set up at 1000 yards from the muzzle of the howitzer. The first plate fired at was an 8-inch plate set at 00 obliquity. The firing was begun with a T152E5 Shell and the shell were alternated in order to compare fuze action and the degree of spalls. The first round went over the plate but the second round, a T152E6 Shell, hit. The next 3 rounds, 2 T152E5 and one T152E6, hit the plate and gave good spalls. Round Six, T152E6, hit the plate but functioned low order. The seventh round, T152E5, fell short of the plate but functioned perfectly. Upon examination to determine why the shell failed to reach the plate it was found that the jacking plate of the field carriage had sunk approximately one inch into the ground. The gun was then re-boresighted before firing. Upon firing Round Eight, T152E6, the shell struck the forward edge of the 5-inch spatter plate. See Appendix C, Photograph B22049. The round functioned high order and produced laminations on the face which were 14 inches long with a measurable center depth of 7 inches. Rounds Nine through Thirteen, 3 T152E5 and 2 T152E6 shell, gave complete back spalls on the plate. A second German "King Tiger" tank hull was placed 1300 yards from the muzzle and a T152E5 shell was fired at it. A direct hit was scored on the main front plate with a resulting 14 x 18 1/2 back spall 2 inches deep. The hit, which was high order, fractured all the welds on the main front plate as well as the welds on both sides. The hull was moved backwards 5 feet from the prefiring position. It was decided that any further firing on the hull would fail to yield useful information, as the damage was too extensive. See Appendix C, Photographs B22005-B22009, B22045-B22049, B24635-B24638.
- a. A 7-inch plate was then placed at a 1000 yards from the muzzle at 60° obliquity. The bottom edge of the plate was dug into the ground and the top edge supported by an M36 Gun Motor Carriage. The first round fired, a T152E5 shell, missed the plate but the second and third rounds, T152E6 and T152E5, hit the plate. The second round struck the top edge and broke part of the plate away. The third round spalled the plate. The gun shifted on firing the fourth round and the Shell, T152E6, missed the top of the plate and impacted on the base of the turret of the M36 Gun Motor Carriage. This round functioned high order and blew the top of the turret off the carriage causing the carriage to burn with complete destruction to the motor and related components within the carriage. (See Appendix C, Photographs B24755 to B24760.) It is estimated that the turret of the M36, Motor Carriage with the extra side plates weighed approximately ten to fifteen tons.
- b. Although it was questionable whether to continue firing (as the ground was soft, which permitted movement of the field mount) it was decided to continue firing. The next 3 rounds were 2 Tl52E5 shell and a Tl52E6 which functioned high order. Rounds Five and Seven failed to give complete spalls, but the bulges of both rounds had cracks that partially encircled the base. Round Six gave a complete spall. Round Eight, a Tl52E6 shell, hit adjacent to Round Six and was low order and no bulge or spall resulted. Round Nine, a Tl52E5 shell, impacted high order in the vicinity of Round Seven and did not bulge or spall. It is believed that the previous hits on the plate where either bulges or spalls occurred caused that area of the plate to be laminated and the next hit in the vicinity of the laminations absorbed part of the shock wave. It was found that in some of the spalls on this plate that small flat pieces of the plate could be picked out and other pieces of the plate inside

the spalled area could be moved. (See Appendix C, Photograph B25726.) Rounds Ten, Eleven and Twelve, 2 T152E6 and one T152E5 shell, gave satisfactory back spalls on the plate. The size of the spalls on this plate were smaller than those previously encountered, but the charpy value of 103.77 - 91:46 for the plate was much higher than on previous plates fired. (See Appendix C, Photographs B-24755-60 and B25724-26.)

4. In the fourth phase, for maximum range and dispersion, all rounds were live-loaded and fired at 45° elevation. The first rounds fired were a group of 10-rounds Shell, HE, M107, which were assembled with a standard point-detonating fuze. This group was followed by 12 rounds of T152E5 shell and 8 rounds of T152E6 shell. The results of this firing were:

	MUZZIE V	ELOCITY(fps)	RANGE	(yards)	TIME OF	FLIGHT (sec.)
PROJECTILE	AVERAGE	SID. DEV.	AVERAGE	STD. DEV.	AVERAGE	STD. DEV.
M107	1837	6.36	15918	59.71	59.50	0.58
T152E5	1829	2.94	11302	95.14	52.23	0.57
T152E6	1831	3.70	11865	57.52	53.20	0.20

- 5. A chemical and metallurgical analysis of a section of the "King Tiger" main frontal plate was made. It was determined that the plate was of relatively poor quality and therefore, the armor was ineffective against this type of round. (See Appendix E, Metallurgical Report No. 57-P-45.)
- 6. The preliminary results of the panel fragmentation test show a high degree of fragmentation with high velocity from the nose and side spray of both shell. In an evaluation of the size of fragments and the velocities of both HEP shell and the HE, M107, the T152E5 design was superior. It is felt that the T152E5 shell might be modified to incorporate a point-detonating, mechanical time or VT fuze which would make the shell suitable for airburst against either unsheltered or poorly sheltered personnel. A fuze of the above-mentioned type could be assembled to the shell by means of a standard adapter ring mounted internally as the forward end of the ogive. A dummy fuze with a suitable nose pad could be assembled to the shell if it was desired to have HEP action. A base-detonating fuze would remain as an integral part of the shell. Considerable production time and cost would be saved as the current operation for the construction and manufacture of the nose of the HEP shell requires several operations.
- 7. Since the number of rounds of both shell designs were limited in quantity, further evaluation of the shell was restricted. Had the supply been adequate, it would have been advantageous to compare the velocity and range of both shell designs with the HE, MIO7 in firing with the standard M4Al, Zone 7 Charge. However, it was calculated from the results of the range firing phase that the T152E5 and E6 shell if used with the M4Al charge would give the following increase in velocity and range:

PROJE	CTILE		~ ~~	
TYPE	WEIGHT (1bs)	VELOCITY (fps)	EXPECTED PRESSURE psi/100	EXPECTED RANGE (yards)
T152E5	71.0	2151	241	14,052
T152E6	78.0	2051	251.	13,705

8. Copies of the panel fragmentation report with the firing record will be distributed at a later date.

#### IV CONCLUSIONS

It is concluded that:

The Shell, HEP, 155mm, T152E5 is superior to Shell, HEP, 155mm, T152E6 in accuracy and armor-defeating qualities.

#### V RECOMMENDATIONS

It is recommended that:

- Shell, HEP, 155mm, T152E5 be considered superior to Shell, HEP, 155mm, T152E6 for the defeat of armor.
- Consideration be given to redesign of the shell incorporating a pointdetonating, mechanical time or VT fuze in combination with a base-detonating fuze for air burst against personnel, in addition to its armor-defeating qualities.
- Additional studies be made with the T152E5 Shell for possible employment in the 155mm, Ml, Gun, with respect to maximum range determination, defeat of armor and bunkers, and accuracy up to 2000 yards.
- D. An evaluation of the standard M4Al Charge be made in conjunction with the T152E5 Shell in an attempt to eliminate requirements for a special charge.

SUBMITTED:

Proof Director

REVIEWED:

H. B. ANDERSON Chief, Artillery

Ammunition Branch

APPROVED:

Assistant to the Deputy Director

for Engineering Testing

Development and Proof Services

Chief, Artillery Division

#### APPENDICES

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#### ORDNANCE CORPS PICATINNY ARSENAL DOVER. NEW JERSEYMr. T.Clifford/bjb/2269

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APPENDIX A

IN REPLY REFER TO: ORDBB-TE5

470 (741-80034) 155 mine

SUBJECT:

Test Program Request Nr. TE-20, Accuracy and Armor

Defeating Evaluation of Shell, HEP, 155mm, T152E5

and T152E6 (U)

TO:

Commanding General Aberdeen Proving Ground Aberdeen, Maryland

ATTENTION: ORDBG-DP-TA (Mr. H. B. Anderson)

1. Inclosed is Test Program Request Nr. TE-20, D/A Priority 1B, for testing of 135 subject shell. These shell with bagged propelling charges, the description of which is furnished in the inclosed Test Program Request, are scheduled for shipment to your Proving Ground during the week of 28 January 1957. Ammunition Data Cards Nrs. 83332, 83333, 83334, and 83335, in triplicate, covering the subject shell and Drawing P-87758, dated 12 September 1955, in duplicate, covering the Fuze, BD, T-, Adjustable, used in the Composition A-3 loaded shell, are inclosed for your information and file.

#### 2. Funding Data:

Funds are available under Sub-Project Order Number 70405530-01-10201-01, and Job Order Number 3039-99-901.

#### 3. Coordination:

- OGO ORDTA
- b. APG Artillery Ammunition Branch, ORDBG-DP-TA
- c. Picatinny Arsenal Engineer primarily responsible for the test is Mr. T. Clifford, phone: Picatinny Arsenal, Extension 2269.

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A-1

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ORDBB-TE5

SUBJECT: Test Program Request Nr. TE-20, Accuracy and Armor Defeating Evaluation of Shell, HEP, 155mm, T152E5 and T152E6 (U)

4. Notification for Test Attendance:

Mr. T. Clifford will attend the test, and requests notice three days prior to the firing.

FOR THE COMMANDER:

A. H. Wong 6 Incls R. H. WOOD 2. TPR Nr. TE-20 (C) ild lay for BPS-PP- Ass (six copies) uddlay for Colore + old lay in Name, 2-5. Ammo Data Cards Nrs. Assistant

83332, 83333, 83334, 83335 (in Trip)

46. Dwg. P-87758 (in Dupe)

CC OCO-ORDTA w/Incls 1-6 Chamberlain Corporation w/Incl 1 100 Mildred Street Waterloo, Iowa APG-Comptrollers Office

Mr. T. Clifford/bjb/2269
Test Program Request Nr. TE-20(C)
(Job Order Nr. 3039-99-901)
Picatinny Arsenal, Dover, N. J.
29 January 1957

#### 1. Material for Test:

- a. 34 each Shell, HEP-T, Inert-Loaded, 155mm, T152E5, with Fuze, BD, M91Al, Inert-Loaded with Live Tracer, Lot PA-E-23878.
- b. 11 each Shell, HEP-T, Inert-Loaded, 155mm, T152E6, with Fuze, BD, M91Al, Inert-Loaded with Live Tracer, Lot PA-E-23879.
- c. 48 each Shell, HEP, Comp A-3 Loaded, 155mm, T152E5, with Fuze, BD, T-, Adjustable, Lot PA-E-23880.
- d. 42 each Shell, HEP, Comp A-3 Loaded, 155mm, T152E6, with Fuze, BD, T-, Adjustable, Lot PA-E-23881.
- e. 82 each Charge, Propelling, T-, for 155mm Howitzer, Projectile, HEP, T152E5, Lot PA-E-24685.
- f. 53 each Charge, Propelling, T-, for 155mm Howitzer, Projectile, HEP, T152E6, Lot PA-E-24684.

#### 2. Project Authority:

- a. Ordnance Project Number TA1-5002H.
- b. Department of the Army Number 5A04-01-001.
- c. Funds available under Sub-Project Order Number 70405530-01-10201-01, and Job Order Number indicated above.
  - d. D/A Priority 1B.

#### 3. Object of Development or Experiment:

To compare the accuracy and armor defeating capabilities of 155mm, T152E5 HEP Shell (Thin Wall), with T152E6 HEP Shell (Heavy Wall), and to ascertain optimum fuze functioning time for both shell by use of the Fuze, BD, T-, Adjustable.

Test Program Request Nr. TE-20 (C) (Cont)

#### 4. History Sketch:

On 2 June 1954, the following 155mm, T152E4 HEP Shell were fired from the 155mm Howitzer, Ml, at Aberdeen Proving Ground in accordance with TPR-3672:

- a. Three shell for recovery at an average chamber pressure of 34,600 PSI and an average muzzle velocity of 2300 fps, range 9500 yards. Recovered shell indicated good band engraving and no distortion.
- b. Four shell against 7" thick armor plate of 64 ft.lbs. Charpy impact value at -40°F, resulting in hinged spalls.

On 8 June 1954, the following five 155mm, T152E4 HEP Shell were fired against 7" thick armor plate with a Charpy impact value of 45 to 48 ft.lbs. at -40°F from the 155mm, T80 Gun at Aberdeen Proving Ground, in accordance with TPR-3672:

- Nr. 1 Hit and destroyed velocity coil.
- Nr. 2 Velocity 1148 fps, plate at 00 Spalled.
- Nr. 3 Velocity 1489 fps, plate at 00 Spalled.
- Nr. 4 Velocity 1496 fps, plate at 600 Spalled.
- Nr. 5 Velocity 1231 fps, plate at 60° Spalled.

The limited results of the above tests appeared to indicate the necessity of controlled mechanical properties in target plates if valid test results are to be expected, and that additional explosive confinement, by means of heavier shell walls, would increase the terminal effectiveness, as had been the case in previous experiments with other caliber shell.

The T152E5 Shell submitted for test under this TPR are similar to the T152E4, with the exception that the flanged base plug and flat copper gasket of the -E4 have been changed to a base plug with a caulking groove and a copper and lead caulked gas check. Weight of empty metal parts for the T152E5 is 38.1 to 38.6 lbs.; weight of charge is 25.7 to 26.1 lbs.; as fired weight is 69.78 to 70.44 lbs.

The T152E6 is similar to the -E5 Model, with the exception of a heavier side wall and ogive. Weight of empty metal

Test Program Request Nr. TE-20 (C) (Cont)

parts for the T152E6 is 47.3 to 48.6 lbs.; weight of charge is 23.6 to 24.4 lbs.; as fired weight is 77 to 78.3 lbs.

## 5. Description in Detail of Improvements Made Since Last Proving Ground Test:

Both the -E5 and -E6 Model shell have a new base plug and a caulked copper and lead gas check, described under the History Sketch. This type of base closure has a greater degree of safety than the flat gasket type, since it will effectively maintain its seal against higher chamber pressures.

Both the -E5 and -E6 Shell, Lots PA-E-23880 and -23881 are assembled with Fuze, BD, T-, Adjustable, Drawing P-87758, dated 12 September 1955. Functioning time of these fuzes may be adjusted in the field by setting the length of firing pin travel from .030" to .210", in accordance with instructions contained in Drawing P-87758, Notes D and E.

Propellant charges have been established for both -E5 and -E6 Model shell at this Arsenal. These charges will produce 1850 fps muzzle velocity at an approximate chamber pressure of 30,000 PSI and will be supplied, ready for use, with the shell.

#### 6. Local Tests:

Propellant charge establishment with uniform velocity series firings for both T152E5 and T152E6 Shell has been conducted at this Arsenal during December 1956, using the 155mm Howitzer, M1.

#### 7. Object of Test:

To determine and compare the accuracy, armor defeating capabilities and optimum fuze functioning time for 155mm T152E5 and -E6 HEP Shell.

#### 8. Precautions in Handling and Testing:

The usual precautions in handling and testing of HE loaded experimental 155mm HEP Shell assembled with experimental fuzes should be followed. The Fuze, BD, T-, Adjustable, contains all the safety features of the standard Fuze, BD, M91A1; however, there is a very remote possibility of gas leakage through the adjusting screw threads at the rear of the fuze and

Test Program Request Nr. TE-20 (C) (Cont)

since this fuze has not previously been used with ammunition fired from a weapon, appropriate safety precautions should be taken.

#### 9. Recommended Test Program:

Fire all shell from the 155mm Howitzer, Ml, using the propelling charges supplied. Resultant muzzle velocity of 1850 fps is similar to that of the M107 HE Shell fired with Zone 7 Charge.

- a. Fire three groups of ten each Shell, T152E5, Inert-Loaded, Lot PA-E-23878 (total 30) against an accuracy target approximately 16 feet square at 1000-yard range. Record muzzle velocity, chamber pressure, time of flight, and accuracy. Photograph target after each group of ten rounds. The four remaining inert T152E5 Shell of Lot PA-E-23878 may be used as warmers and spotting rounds.
- b. Fire one group of ten Shell, T152E6, Inert-Loaded, Lot PA-E-23879, against an accuracy target approximately 16 feet square at 1000-yard range. Record muzzle velocity, chamber pressure, time of flight and accuracy. Photograph target. The one remaining inert T152E6 Shell of Lot PA-E-23879 may be used as a warmer and spotting round.
- c. Fire 30 Shell, Tl52E5, Comp A-3 Loaded, Lot PA-E-23880, and 30 Shell, Tl52E6, Comp A-3 Loaded, Lot PA-E-23881, against armor plate of specified thickness and obliquity, having a Charpy impact value of 35 to 50 ft.lbs., at -40°F at an approximate range of 100 yards.

#### Shell, HEP, T152E5, Lot PA-E-23880

Nr. Shell	Plate Thickness	Obliquity
5	811	00
5	711	00
5	6"	00
5	811	60°
5	711	60°
5	6"	60°

Test Program Request Nr. TE-20 (C) (Cont)

#### Shell, HEP, T152E6, Lot PA-E-23881

Nr.	Shell	Plate	Thickness	Obliquity
	5		8"	00
	5		711	00
	5		6 <b>"</b>	00
	5		8"	60°
	5		7"	60°
	5		6"	60°

When plate of a specified thickness and obliquity is defeated by a series of five shell, five additional confirming shell will be fired against the same plate, and firings against thinner plates at the same obliquity cancelled. Record the following data for each shell:

- (1) Muzzle velocity
- (2) Striking velocity
- (3) Facial impression dimensions
- (4) Spall size, weight and velocity
- (5) Recover and photograph spalls
- (6) Photograph front and back of target plate
- (7) Photograph one each T152E5 and -E6 Shell with propelling charge prior to firing.

Setting of fuze functioning time for Comp A-3 Loaded shell will be demonstrated by Picatinny Arsenal representative who will furnish thread sealing cement specified on Drawing P-87758. Prints of this drawing, in duplicate, will be supplied the Proving Ground.

Shell must be conditioned at a minimum temperature of 70°F prior and during application of thread sealing compound.

Test Program Request Nr. TE-20 (C) (Cont)

The following tools will be required for fuze setting:

- (1) Micrometer Depth Gage
- (2) Heavy screw driver
- (3) 1-1/8" open-end or adjustable wrench
- (4) Strap wrench or vise suitable to hold 155mm Shell body.
- d. Fire ten Shell, T152E5, Comp A-3 Loaded, Lot PA-E-23880, and ten Shell, T152E6, Comp A-3 Loaded, Lot PA-E-23881, against the thickest plate defeated at 60° obliquity under phase c, at a range of 1000 yards and 60° obliquity.

Record muzzle velocity, facial impression dimensions and spall size for each shell. Calculate striking velocity for each shell. Recover and photograph spalls and back and front of target plate. Still photographs of shell striking target will be required, with camera at or near weapon position.

e. Composition A-3 Loaded shell of Lots PA-E-23880 and -23881 remaining after completion of phases c and d should be fired against an armored vehicle hull at an approximate range of 100 yards. A report of damage with photographs will be required. Still photographs of shell striking target will also be required, with camera at or near weapon position.

#### 10. References:

- a. Letter, OCO to PA, ORDBB 471.14/975-139, 16 Sep 50.
- b. OCM-34159, 10 April 1952.
- c. Test Program Request Nr. 3672, dated 13 April 1953.

REGRADING DATA CANNOT BE PREDETERMINED

Test Program Request Nr. TE-20 (C) (Cont)

#### 11. Report Distribution:

- a. Test Report security classification Confidential.
- b. 1 Copy OCO ORDTA 1 Copy APG ORDBG-DP-TA 1 Copy Chamberlain Corporation
  - 5 Copies Picatinny Arsenal:
    - 1 Copy ATTN: Inspection Division
    - 1 Copy ATTN: ORDBB-TE5
    - 1 Copy ATTN: ORDBB-TE8 1 Copy - ATTN: Propellant & Explosive Lab
    - 1 Copy ATTN: Fuze Development Lab

D. R. BEEMAN Acting Director Samuel Feltman Ammunition Labs

J. E. RAINIER Assistant.

P. R. NO.	KIND			MUNITION DA			AMM. LC	T NO.
	0	m T 1 T		1 CC184 M1 COTE W4	th Fura BD		PA-E-2	3878
EC. NO.	Shell, REP-	T Inert Lo	baded, .	155MM, T152E5.W1	DENTY.			Y IN LOT
	M91Al Inert	Loaded Wit	U TIA6	Tracer		1.		48
RG. NO.	ORG. DATE OR REV.	ALLOT. ADVICE		PROJECT NO.	RAD OR EPO	NO.		Y IN SHIPME
None				TA1-50024				
	PROP. CHARGE	EXPECTED M. V		EXPECTED PRESSURE	ASSEMBLED E	BY	DATE OF	ASSEMBLY
629-176					PA		Septem	ber, 1956
*Filler Inert Shell ring ga Weight of load	acked: 1 Shell: 65% Borax, ged 100%. Employed and drille min., 70.	30% K <sub>2</sub> SO <sub>L</sub> , pty weight and shell	5% Gra		min., 28.6	1b "A	s. max s Fire	d" weight
OMPONENT	LANDON A COM	Fuze M91A1		*Filler		T		1
IND		BD. Inert		Inert		<del> </del>		
110		With Live 1	racer	THOIC				
RG. NO.		73-2-239	14001		EGRADING DATA	CANNO	T BE PR	ETERMINED
RG. DATE OR REV.		1-30-53			EGRADING DAIA	CAMINO	, DE TI	
FG'D BY	Chamberlain			PA		-		
ATE		1956		1956				
OT NO.		PA-E-23981		None		1		
J1 110.	100-1100	125-11-27/02		Mono	(1)	200	4	
STEAMS Showing to Sample .	P. Puccio Ars Opers	DIVISION	DOVER	CERTIFIED TO BY:	Inspec	ction		DIVISIO
TOUR MANAGEMENT OF THE PROPERTY OF	Ars Opers	ERIMENT	AL AN	AMUNITION D	Inspect	etion D	NO. {	
APRY-P.A. BOVER, N.J. 10 Open 43 10-10-18 10-17 P. R. NO. SPEC. NO.	Ars Opers  999dbull EXP  KIND Shell, HEP- 191Al Iner	ERIMENTA T, Inert Lot t Loaded Wi	AL AM	MMUNITION D	Inspect	etion D	NO. (	DIVISIO 33333 LOT NO.
SPEC. NO.	Ars Opers	ERIMENTA T, Inert Lot t Loaded Wi	AL AM	MMUNITION D  1.55MM, T152E6 William  PROJECT NO.	Inspect	etion	NO. ( AMM. PA-E- QUANT	B3333 LOT NO. -23879 ITY IN LOT
ASBY-P.A. BOYER, H.J., oppose-43 to-to-ts to-ty- T.P.R. NO.  SPEC. NO.  DRG. NO.  NOME	Ars Opers  999dbull EXP  KIND Shell, HEP- 191Al Iner	ERIMENTA  T, Inert Lot Loaded William	AL AM	MMUNITION D  1.55MM, T152E6 William  PROJECT NO.  TA1-5002H	Inspector Inspector ATA CARI	ction  CT//F	NO. AMM. PA-E- QUANT	DIVISIO 33333 LOT NO. -23879 ITY IN LOT 20 ITY IN SHIPM
ASBY-P.A. BOYER, H.J., oppose-43 to-to-ts to-ty- T.P.R. NO.  SPEC. NO.  DRG. NO.  NOME	Ars Opers  Woodbull EXP  KIND  Shell, HEP-  M91Al Iner  DRG. DATE OR REV.	ERIMENTA  T, Inert Lot Loaded Will  ALLOT. ADVI-	AL AM paded, 1 th Live	MMUNITION D  1.55MM, T152E6 William  PROJECT NO.  TA1-5002H  EXPECTED PRESSURE	Inspector 2) ATA CAR	ction  CT//F	NO. ( AMM. PA-E- QUANT QUANT	DIVISIO 33333 LOT NO. -23879 ITY IN LOT 20
ARMY-P.A. BOVER, N.J., ODDER-43 10-10-88 10-0  J. P. R. NO.  DRG. NO.  NONE P. A. X. O. 629-176  REMARKS: #Filler Inert ####################################	Ars Opers  Specific Control of the Property of	ERIMENTA  T, Inert Lot Loaded Will  ALLOT. ADVIN  EXPECTED M.  ell/wood bo 30% K2SOL, max. Wt of	DOVER  AL AN  baded, 1 th Live  ce y.  x - sad 5% Gra loaded	MUNITION D  155MM, T152E6 William  Tracer  PROJECT NO.  TAI-5002H  EXPECTED PRESSURE  ddle pack.  aphite. Shell r.  i and drilled shells max.	Inspector Inspec	ction  One of the control of the con	NO. ( AMM. PA-E- QUANT QUANT DATE Septe	B33333 LOT NO23879 ITY IN LOT 20 ITY IN SHIPM OF ASSEMBLY ember, 19
ARMY-P.A. DOVER, M.J., popular 1900 V.P.R. NO.  SPEC. NO.  DRG. NO.  None P.A.X.O. 629-176  REMARKS: *Filler Inert #/. 221bs mir "As fired" wt	Ars Opers  Special EXP  KIND  Shell, HEP- M91Al Iner  DRG. DATE OR REV.  PROP. CHARGE  Packed: 1 Sh.  5. 65% Borax,  1, 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ERIMENTA  T, Inert Lot Loaded Will  ALLOT. ADVIN  EXPECTED M.  ell/wood bo 30% K2SOL, max. Wt of	DOVER AL AM Paded, 1 th Live CE V.  SX - sad Si Gra loaded	MMUNITION D  155MM, T152E6 William  Tracer  PROJECT NO.  TA1-5002H  EXPECTED PRESSURE  ddle pack.  aphite. Shell r.  i and drilled shells max.	Inspector Inspec	ction  One of the control of the con	NO. ( AMM. PA-E- QUANT QUANT DATE Septe	B33333 LOT NO23879 ITY IN LOT 20 ITY IN SHIPM OF ASSEMBLY ember, 19
ARMY-P.A. DOVER, M.J., popular 1900 V.P.R. NO.  SPEC. NO.  DRG. NO.  None P.A.X.O. 629-176  REMARKS: *Filler Inert #/. 221bs mir "As fired" wt	Ars Opers Voodbull EXP KIND Shell, HEP- 191Al Iner DRG. DATE OR REV. PROP. CHARGE Packed: 1 Sh 1: 65% Borax, 1, 1/2-4/5 lbs 1: of shell 25.	ERIMENT  T, Inert Lot t Loaded Will  ALLOT. ADVI-  EXPECTED M.  ell/wood bo 30% K <sub>2</sub> SO <sub>L</sub> , max. Wt of  / lbs min	DOVER AL AM Paded, 1 th Live CE V.  Six - sad loaded	MUNITION D  155MM, T152E6 William PROJECT NO. TA1-5002H EXPECTED PRESSURE  ddle pack. aphite. Shell railed shells max.  #Filler Inert	Inspector Inspec	ction  One of the control of the con	NO. ( AMM. PA-E- QUANT QUANT DATE Septe	B33333 LOT NO23879 ITY IN LOT 20 ITY IN SHIPM OF ASSEMBLY ember, 19
ARMY-P.A. BOVER, M.J., oppose 49 10-10-18 100 VI.P.R. NO.  DRG. NO.  None P.A.X.O. 629-176  REMARKS: #Filler Inert #/ 221bs mir "As fired" wt	Ars Opers Voodbull EXP KIND Shell, HEP- M91A1 Iner DRG. DATE OR REV. PROP. CHARGE Packed: 1 Sh 1: 65% Borax, 1, 1 1555M T155E6	ERIMENT  T, Inert Lot t Loaded Wi  ALLOT. ADVI- EXPECTED M.  ell/wood bo 30% K <sub>2</sub> SO <sub>1</sub> , max. Wt of 2/ lbs min  Fuze BD M91Al Ine With Live	DOVER AL AM Paded, 1 th Live CE V.  Six - sad loaded	MUNITION D  155MM, T152E6 William PROJECT NO. TA1-5002H EXPECTED PRESSURE  ddle pack. aphite. Shell railed shells max.  #Filler Inert	Inspector Inspec	ction  One of the control of the con	NO. ( AMM. PA-E- QUANT QUANT DATE Septe	B33333 LOT NO23879 ITY IN LOT 20 ITY IN SHIPM OF ASSEMBLY ember, 19
ARBY-P.A. BOVER, N.J., popular 100 VI.P.R. NO.  DRG. NO.  None P.A.X.O. 629-176  REMARKS: *Filler Inert #As fired" wt  COMPONENT KIND  DRG. NO.	Ars Opers Voodbull EXP KIND Shell, HEP- M91A1 Iner DRG. DATE OR REV. PROP. CHARGE Packed: 1 Sh 1: 65% Borax, 1, 7 1 1bs 1: of shell 2 MPTS Assy 155MM T152E6 J7577-599	ERIMENT  T, Inert Lot t Loaded Wi  ALLOT. ADVI- EXPECTED M.  ell/wood bo 30% K <sub>2</sub> SO <sub>1</sub> , max. Wt of  / lbs min  Fuze BD M91A1 Ine With Live 73-2-239	DOVER AL AM Paded, 1 th Live CE V.  Six - sad loaded	MUNITION D  155MM, T152E6 William PROJECT NO. TA1-5002H EXPECTED PRESSURE  ddle pack. aphite. Shell railed shells max.  #Filler Inert	Inspector Inspec	ction  One of the control of the con	NO. ( AMM. PA-E- QUANT QUANT DATE Septe	B33333 LOT NO23879 ITY IN LOT 20 ITY IN SHIPM OF ASSEMBLY ember, 19
ARMY-P.A. BOVER, M.J., opposed to the control of th	Ars Opers Veoghull EXP KIND Shell, HEP- 191A1 Iner DRG. DATE OR REV. PROP. CHARGE Packed: 1 Sh 1: 65% Borax, 1, 7 1 1bs 2: of shell 2 MPTS Assy 1551M T152E6 J7577-599 6-1-55	ERIMENT  T, Inert Lot Loaded Wine EXPECTED M.  ell/wood bo 30% K2SOL, max. Wit of 2 / lbs min  Fuze BD  M91A1 Ine With Live 73-2-239 1-30-53	DOVER AL AM Paded, 1 th Live CE V.  Six - sad loaded	MMUNITION D  155MM, T152E6 William Tracer  PROJECT NO. TA1-5002H EXPECTED PRESSURE  ddle pack. aphite. Shell r. i and drilled shells max.  #Filler Inert	Inspector Inspec	ction  One of the control of the con	NO. ( AMM. PA-E- QUANT QUANT DATE Septe	B33333 LOT NO23879 ITY IN LOT 20 ITY IN SHIPM OF ASSEMBLY ember, 19
ARMY-P.A. BOVER, N.J., ODDR-43 10-10-88 100 V.P.R. NO.  DRG. NO.  DRG. NO.  NONE P.A.X.O. 629-176  REMARKS: *Filler Inert #//.221bs mir "As fired" wt  COMPONENT KIND  DRG. NO.  DRG. NO.  DRG. NO.  DRG. NO.  DRG. NO.  DRG. DATE OR REV.  MFG'D BY	Ars Opers  Veoghull EXP  KIND  Shell, HEP- M91A1 Iner  DRG. DATE OR REV.  PROP. CHARGE  Packed: 1 Sh 1: 65% Borax, 1, 72.45 lbs 1551M  T152E6 J7577-599 6-1-55 Chamberlain	ERIMENTA  T, Inert Lot Loaded Will  EXPECTED M.  ell/wood bo 30% K2SOL, max. Wt of  / lbs min  Fuze BD  M91Al Ine With Live 73-2-239 1-30-53 PA	DOVER AL AM Paded, 1 th Live CE V.  Six - sad loaded	MMUNITION D  155MM, T152E6 William  Tracer  PROJECT NO.  TA1-5002H  EXPECTED PRESSURE  ddle pack. aphite. Shell r is and drilled she  Colbs max.  *Filler  Inert  PA	Inspector Inspec	ction  One of the control of the con	NO. ( AMM. PA-E- QUANT QUANT DATE Septe	B33333 LOT NO23879 ITY IN LOT 20 ITY IN SHIPM OF ASSEMBLY ember, 19
ARBY-P.A. DOVER, W.J., popular 100 VI.P.R. NO.  DRG. NO.  NONE P.A.X.O. 629-176  REMARKS: *Filler Inert #/. 22.1 bs mir "As fired" wt  COMPONENT KIND  DRG. NO.  DRG. NO.  DRG. NO.  DRG. NO.  DRG. DATE OR REV.  MFG'D BY  DATE	Ars Opers  Very de la	ERIMENT  T, Inert Lot Loaded Will  ALLOT. ADVI-  EXPECTED M.  ell/wood bo 30% K <sub>2</sub> SO <sub>1</sub> , max. Wit of  / lbs min  Fuze BD  M91Al Ine With Live 73-2-239 1-30-53 PA 1956	DOVER AL AM Paded, 1 th Live CE V. V. Saded Si Gra loaded	MMUNITION D  155MM, T152E6 William  Tracer  PROJECT NO.  TA1-5002H  EXPECTED PRESSURE  ddle pack. aphite. Shell r is and drilled she  Colbs max.  *Filler  Inert  PA  1956	Inspect	Co No.  BY	NO. ( AMM. PA-E- QUANT QUANT DATE Sept. Empty	DIVISIO  33333 LOT NO.  -23879 ITY IN LOT 20 ITY IN SHIPM OF ASSEMBLY ember, 19  wt of she 2 Clbs ma
ARBY-P.A. DOVER, M.J., popular to the property of the property	Ars Opers  Veoghull EXP  KIND  Shell, HEP- M91A1 Iner  DRG. DATE OR REV.  PROP. CHARGE  Packed: 1 Sh 1: 65% Borax, 1, 72.45 lbs 1551M  T152E6 J7577-599 6-1-55 Chamberlain	ERIMENTA  T, Inert Lot Loaded Will  EXPECTED M.  ell/wood bo 30% K2SOL, max. Wt of  / lbs min  Fuze BD  M91Al Ine With Live 73-2-239 1-30-53 PA	DOVER AL AM Paded, 1 th Live CE V. V. Saded Si Gra loaded	MMUNITION D  155MM, T152E6 William  Tracer  PROJECT NO.  TA1-5002H  EXPECTED PRESSURE  ddle pack. aphite. Shell r is and drilled she  Colbs max.  *Filler  Inert  PA	Inspector Inspec	Co No.  BY	NO. ( AMM. PA-E- QUANT QUANT DATE Sept. Empty	DIVISION DIVISION DIVISION NO23879 ITY IN LOT 20 ITY IN SHIPM OF ASSEMBLY DEMONT, 19 wt of sh

CONFIDENTIAL

T. P. R. NO.	WoodhullEXPE							AMM. L	
SPEC. NO.	Shell, HEP,	Comp A-3 Lo	aded, 1	5510M	T152B5 with	Fuze BD, T	-		-23880
SPEC. NO.	Adjustable				SONE	Alm vails		QUANTII	Y IN LOT
DRG. NO.	DRG. DATE OR REV.	ALLOT. ADVICE		PROJECT		RAD OR EPO		OHANTIT	48 Y IN SHIPMEN
	DAG. DATE OR REV.	ALLOI. ADVICE				RAD OR EPO	NO.	COARTI	I IN SHIPMEN
None P. A. X. O.	PROP. CHARGE	EXPECTED M.		TAI-5	D PRESSURE	ASSEMBLED B		DATE O	F ASSEMBLY
	PROF. CHARGE	EXPECTED M.	٠.   ١	EXPECTE	D PRESSURE	A	1		
REMARKS:	Packed: 1 She	12 6vas 2 have	2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -		1-	I PA		Septen	ber 1956
lvg specific g	hell <u>27.17</u> lbs gravity of cha caded using <u>\</u> ze set so perc	rge / tons	loaded v	wt. PSI).	"As Fired" Shell x-r	ayed and ri	min ng g	10.4.	lbs max.
COMPONENT	MPTS Assy	Fuze BD	Filler						Т
KIND	155MM T152E5	T-	Comp. A						
	TOWN ILICES	Adjustable		-		GRADING DATA	ANNO	BE THE	DETERMINED
RG. NO.	J7577-441	P-87758	JAN-C-L	440	- PI	GRAUING PATA			
RG. DATE OR REV.	8-28-54	9-12-55	1-31-47						
FG'D BY	Chamberlain	PA	Wabash	Ord					
DATE	1955	1956	1954						
OT NO.	YCC-1153	PA-E-23909	WAB-13-	-411				sheere	0
-	Ars Opers	DIVISION	DOVER.	. NEW		Inspect	ion		DIVISION
PRE-72 10-10-88 100 C. P. R. NO. SPEC, NO.	WassibullEXPE KIND Shell, HEP, T-Adjustabl	ERIMENTA  Comp. A-3,	Loaded,	MUN , 1551	SENAL 241  JERSEY  ITION DA  M, T152E6	Inspect  A CARD  With Fuze B	) 4 D,	NO. E	33335 ot No. -23881 TY IN LOT
T. P. R. NO.  SPEC. NO.  DRG. NO.	WasshullEXPE KIND Shell, HEP,	ERIMENTA  Comp. A-3,	Loaded,	MUN , 1551	ITION DA	Inspect  15'ordly  TA CARD  With Fuze B	) 4 D,	NO. E	33335 ot No. -23881 TY IN LOT
T. P. R. NO.  SPEC. NO.  DRG. NO.	WasabullEXPE KIND Shell, HEP, T-Adjustabl DRG. DATE OR REV.	Comp. A-3,	Loaded,	MUN , 1551 PROJECT	ITION DA	Inspect  Inspect  Inspect  Inspect  Inspect	) 4 D,	NO. E	133335 OT NO. -23881 -27 IN LOT 42
C. P. R. NO.  SPEC. NO.  DRG. NC.  None  P. A. X. O.  629–176	WasdbullEXPE KIND Shell, HEP, T-Adjustabl DRG. DATE OR REV. PROP. CHARGE	Comp. A-3,	Loaded,	MUNI , 1551 PROJECT TA1-50 EXPECTE	ITION DA	Inspect  A CARD  With Fuze B	) 4 D,	NO. 8 AMM. L PA-E- QUANTIT QUANTIT DATE O	33335 OT NO. -23881 TY IN LOT 42 TY IN SHIPMEN
P.A.X.O. 629-176  REMARKS: Empty wt of Avg specific max. Shell Adjustable for	WoodbullEXPE KIND Shell, HEP, T-Adjustabl DRG. DATE OR REV. PROP. CHARGE Packed: 1 She shell 1.2.1.1b gravity of ch press loaded u uze set so Per	Comp. A-3,  ALLOT. ADVICE  EXPECTED M.  11/wood box s min, y y arge c Plg Trave	Loaded, Loaded, v. E Saddl The mail tons 1 is .21	MUN  PROJECT  TA1-50  EXPECTE  le pac  ax. I  loaded  (8000)	ITION DA  M, T152E6  NO. DO2H D PRESSURE  Ck.  Wt of charged wt "As fill opsi). Sh	TA CARD With Fuze B	on  ) 4  D,  NO.  1 lbs  and	NO. 8 AMM. L PA-E QUANTITI DATE O Septe	33335 OT NO. -23881 TY IN LOT 42 TY IN SHIPMEN EMBER, 1950
C.P.R. NO.  SPEC. NO.  DRG. NC.  NONE P.A.X.O. 629-176  REMARKS: Empty wt of Avg specific max. Shell May shell of Adjustable for Component	WasdbullEXPE KIND  Shell, HEP, T-Adjustabl  DRG. DATE OR REV.  PROP. CHARGE  Packed: 1 She shell 47.181b gravity of ch press loaded u uze set so Per  MPTS Assy	Comp. A-3,  Comp. A-3,  ALLOT. ADVICE  EXPECTED M.  EXPECTED M.  Comp. A-3,  Comp. A-4,  C	Loaded,  Loaded,  V. E  Saddl  Joseph J  tons  l is .2]	MUN  PROJECT TA1-50  EXPECTE  le pac ax. It contacts (8000)  (8000)	ITION DA  M, T152E6  NO. DO2H D PRESSURE  Ck.  Wt of charged wt "As fill opsi). Sh	TA CARD With Fuze B	on  ) 4  D,  NO.  1 lbs  and	NO. 8 AMM. L PA-E QUANTITI DATE O Septe	33335 OT NO. -23881 TY IN LOT 42 TY IN SHIPMEN F ASSEMBLY EMBER, 1950
C.P.R. NO.  SPEC. NO.  DRG. NC.  NONE P.A.X.O. 629-176  REMARKS: Empty wt of Avg specific max. Shell May shell of Adjustable for Component	WoodbullEXPE KIND Shell, HEP, T-Adjustabl DRG. DATE OR REV. PROP. CHARGE Packed: 1 She shell 1.2.1.1b gravity of ch press loaded u uze set so Per	Comp. A-3,  Comp. A-3,  ALLOT. ADVICE  EXPECTED M.  Li/wood box s min, / 4 arge / 5 arge / 7 c Plg Trave  Fuze ED	Loaded,  Loaded,  V. E  Saddl  71bs ms 10mm 1  tons 1 is .21	MUN  PROJECT TA1-50  EXPECTE  le pac ax. It contacts (8000)  (8000)	ITION DA  M, T152E6  NO. DO2H D PRESSURE  Ck.  Wt of charged wt "As fill opsi). Sh	TA CARD With Fuze B	on  ) 4  D,  NO.  1 lbs  and	NO. 8 AMM. L PA-E QUANTITI DATE O Septe	33335 OT NO. -23881 TY IN LOT 42 TY IN SHIPMEN F ASSEMBLY EMBER, 1950
T.P.R. NO.  SPEC. NO.  DRG. NC.  None P.A.X.O.  629-176  REMARKS:  Empty wt of Avg specific max. Shell May shell for the component kind	WashullEXPE KIND  Shell, HEP, T-Adjustabl  DRG. DATE OR REV.  PROP. CHARGE  Packed: 1 She shell 121b gravity of ch press loaded u uze set so Per  MPTS Assy 155MM T152E	Comp. A-3,  Comp. A-3,  ALLOT. ADVICE  EXPECTED M.  EXPECTED M.  Comp. A-3,  Comp. A-4,  C	Loaded,  Loaded,  V. E  Saddl  71bs ms 10mm 1  tons 1 is .21	MUN  , 1551  PROJECT  TA1-50  EXPECTE  le pac  ax. 1  loadec  (8000)  lo (F:	ITION DA  M, T152E6  NO. DO2H D PRESSURE  Ck.  Wt of charged wt "As fill opsi). Sh	TA CARD With Fuze B	on  ) 4  D,  NO.  1 lbs  and	NO. 8 AMM. L PA-E QUANTITI DATE O Septe	33335 OT NO. -23881 TY IN LOT 42 TY IN SHIPMEN F ASSEMBLY EMBER, 1950
T.P.R. NO.  SPEC. NO.  DRG. NO.  None P.A.X.O. 629-176  REMARKS: Empty wt of Arty specific	WasdbullEXPE KIND  Shell, HEP, T-Adjustabl  DRG. DATE OR REV.  PROP. CHARGE  Packed: 1 She shell 47.181b gravity of ch press loaded u uze set so Per  MPTS Assy	Comp. A-3,  Comp. A-3,  ALLOT. ADVICE  EXPECTED M.  Li /wood box  s min, / / / /  arge / / /  c Plg Trave  Fuze BD  T-  Adjustabl	Loaded,  Loaded,  V. E  Saddl  Tlbs ms  loam 1  tons  loam 1  comp /  Spec	MUN  PROJECT  TA1-50  EXPECTE  le pac  ax. V  loaded  (8000  lo (F:	ITION DA  MM, T152E6  NO. DOZH D PRESSURE  ck. Wt of charge i wt "As fi O psi). Sh iring Pin t	TA CARD With Fuze B  RAD OR EPO  ASSEMBLED B  PA  REC 3 1b  red" 7700  ell x-rayed  o Detonator	NO.  NO.  S mi. lbs and ).	NO. 8 AMM. L PA-E- QUANTIT  DATE O Septe  min, Z ring 8	33335 OT NO23881 TY IN LOT 42 TY IN SHIPMEN F ASSEMBLY Ember, 1956 F 1bs max F 191bs F 291bs F 291bs
C.P.R. NO.  SPEC. NO.  DRG. NC.  None P.A.K.O.  629-176  REMARKS:  Empty wt of Avg specific max. Shell May	WashullEXPE KIND Shell, HEP, T-Adjustabl DRG. DATE OR REV. PROP. CHARGE Packed: 1 She shell // 1/1b gravity of ch press loaded u uze set so Per MPTS Assy 155MM T152E J7577-599	ERIMENTA  Comp. A-3,  ALLOT. ADVICE  EXPECTED M.  Il/wood box a min, y y arge C Plg Trave  Fuze BD  T.  Adjustabl P-87758 9-12-55 PA	Loaded,  Loaded,  Loaded,  Saddl  Loaded,  Saddl  Loaded,  Filler  Comp /  Spec  JANC-/  Wabash	MUN , 1551 PROJECT TA1-50 EXPECTE le pac ax. 1 loaded (8000 10 (F:	ITION DA  MM, T152E6  NO. DOZH D PRESSURE  ck. Wt of charge i wt "As fi O psi). Sh iring Pin t	TA CARD With Fuze B  RAD OR EPO  ASSEMBLED B  PA  REC 3 1b  red" 7700  ell x-rayed  o Detonator	NO.  NO.  S mi. lbs and ).	NO. 8 AMM. L PA-E- QUANTIT  DATE O Septe  min, Z ring 8	33335 OT NO23881 TY IN LOT 42 TY IN SHIPMEN F ASSEMBLY Ember, 195 T 1bs max 8.191bs Egged 100%
C.P.R. NO.  SPEC. NO.  DRG. NC.  NONE P.A.X.O.  629-176  REMARKS:  Empty wt of Avg specific max. Shell  Adjustable for COMPONENT KIND  DRG. NO.  DRG. NO.  DRG. NO.  DRG. NO.  DRG. DATE OR REV.	WoodbullEXPE  KIND  Shell, HEP,  T-Adjustabl  DRG. DATE OR REV.  PROP. CHARGE  Packed: 1 She shell **2.1*1b gravity of ch press loaded u uze set so Per  MPTS Assy 155MM T152E  J7577-599 6-1-55	Comp. A-3,  ALLOT. ADVICE  EXPECTED M.  11/wood box s min, y y arge	Loaded, Loaded,  Loaded,  Saddl  Loaded,  I tons  Lons  Lons  JANC-L  JANC-L  Wabast  1954	MUN  , 1551  PROJECT  TA1-50  EXPECTE  le pad  ax. I  loaded  (8000  lo (F:  A-3  440  47  h Ord	ITION DA  MM, T152E6  NO. DOZH D PRESSURE  ck. Wt of charge i wt "As fi O psi). Sh iring Pin t	TA CARD With Fuze B	NO.  NO.  S mi. lbs and ).	NO. 8 AMM. L PA-E- QUANTIT  DATE O Septe  min, Z ring 8	33335 OT NO23881 TY IN LOT 42 TY IN SHIPMEN F ASSEMBLY Ember, 1950 T 1bs max 8.191bs Egged 100%
C.P.R. NO.  SPEC. DATE OR REV.  MFG'D BY	WoodbullEXPE KIND  Shell, HEP, T-Adjustabl DRG. DATE OR REV.  PROP. CHARGE  Packed: 1 She shell // 1 h gravity of ch press loaded u uze set so Per  MPTS Assy 155MM T152E  J7577-599 6-1-55 Chamberlain	ERIMENTA  Comp. A-3,  ALLOT. ADVICE  EXPECTED M.  Il/wood box a min, y y arge C Plg Trave  Fuze BD  T.  Adjustabl P-87758 9-12-55 PA	Loaded, Loaded,  Loaded,  Saddl  Loaded,  Saddl  Loaded,  Saddl  Loaded,  Loaded,  Saddl  Loaded,  Loaded,  Wabasl  Loaded,  Wabasl  Loaded,	MUN  , 1551  PROJECT  TA1-50  EXPECTE  le pad  ax. I  loaded  (8000  lo (F:  A-3  440  47  h Ord	ITION DA  MM, T152E6  NO. DOZH D PRESSURE  ck. Wt of charge i wt "As fi O psi). Sh iring Pin t	Inspect  Ins	NO.  NO.  S mi. lbs and ).	NO. 8 AMM. L PA-E- QUANTIT  DATE O Septe  min, Z ring 8	33335 or no. -23881 ry in Lot 42 ry in SHIPMEN F ASSEMBLY Ember, 195 7 1bs max 8.191bs pged 100%

CONFIDENTIAL

A-11

#### ORDNANCE CORPS ACPG OC. A PICATINNY ARSENAL DOVER. NEW JERSEY Mr. T. Clifford/bjb/2269

Trate . W

REFER' TO: SAMUEL FELTMAN AMMUNITION LABORATORIES ONDERTES

SUBJECT: TPR TE-20, Shell, 155 mm, HEP, T152ES and -E6

TO:

Commanding General Aberdeen Proving Ground

Aberdeen, Maryland

ATTENTION: ORDBG-DP-TA (Mr. H. Anderson)

The following data, pertaining to the subject TPR, are inclosed for your information and files:

a. Lists of shell weights for Ammunition Lot Numbers PA-E-23878, 23879, 23880 and 23881 (7 sheets). NOTE: Column marked "Complete Weight" is that of shell as fired.

b. Ammunition Data Cards Numbers 84429 and 84450, in triplicate, pertaining to propelling charges for the subject TPR.

FOR THE COMMANDER:

J. E. RAINIER J. C. Rainier Assistant

6 Incls

1-4 List of shell weights for Lots PA-E-23878, 23879, 23880, 23881

5-6 Ammunition Data Cards Numbers 84429, 84430 (in trip)

772712

## Shell, HEP-T, inert-loaded, 155mm, T152E5 with Fuze, BD, M91A1, inert-loaded

SHELL	EMPTY WI	WT AFTER DRILLING	COMPLETE WT
	<del>-</del>		
42	38.43	64.81	70.49

#### Lot PA-E-23878

#### SHEET 2 of 2

NO NO	EMPTY WI	WT AFTER DRILLING	COMPLETE
43 44 45 46 48 49	38.50 38.45 38.48 38.60 38.60 38.46 38.45	65.02 64.79 64.80 64.89 64.93 64.90	70.69 70.54 70.55 70.60 70.59 70.90 70.52

xo-629-176

# Shell HEP inert-loaded 155mm, T152E6 with Fuze BD, M91Al inert-loaded with live Tracer Lot PA-E-23879

SHELL, NO	EMPTY WI	LOADED	COMPLETE WT
NO 1 35 55 19 46 2 43 60 5 7 57 34 30 4 62 40		72.02 72.11 71.35 72.24 71.46 72.86 72.24 71.33 72.53 72.80 71.71 72.42 72.50 72.43 72.45 72.54	77.70 77.87 77.07 77.17 78.55 77.85 77.10 78.32 78.56 77.38 78.22 78.33 78.18 78.08 78.31
52 8 49 61	48.40 48.11 47.29	71.02 72.72 72.42 71.66	76.77 78.49 78.21 77.50

Shell, HEP, Comp A3 loaded, 155mm, T152E5 with Fuze BD, T - Adjustable

SHELL NO	EMPTY	EMPTY SHELL WITH WATER WT	WT AFTER DRILLING	WT AFTER DRILLING WITH WATER	WI OF CHARGE	COMPLETE WT	DENS
1 2 3 4 5 6 7 8	38.57 38.25 38.64 38.53 38.53 38.59	55•28 55•68	64.35 64.07 64.45 64.55 64.40 64.37	65 <b>.1</b> 4 65,68	25.78 25.82 25.81 26.02 25.87 25.78	70.28 69.99 70.37 70.25 70.35 70.25	1.617 1.632
9 10 11 12 13 14 15 16	38.54 38.46 38.55 38.10 38.36 38.46 38.41 38.37 38.35 38.59	55.21 55.41 55.46	64.61 64.47 64.41 63.93 64.37 64.49 64.19 64.19 64.35 64.48 64.48	64.99 65.46 65.60	26.07 26.01 25.86 25.83 26.01 26.03 25.78 25.82 26.00 25.89 25.98	70.32 70.15 70.29 69.78 70.03 70.16 70.21 70.10 70.08 70.44 70.13	1.609 1.629 1.638
18 19 20 21 22 23 24 25 26 27 28 29 30 31	38.43 38.41 38.50 38.46 38.23 38.54 38.54 38.45 38.45 38.45 38.45 38.45 38.45 38.45	55•33 55•60 55•47	64.30 64.34 64.39 64.32 64.32 64.59 64.40 64.65 64.15 64.15 64.20 64.36	65.05 65.69 65.50	25.87 25.93 25.89 25.86 26.77 26.08 26.00 26.11 25.70 25.88 25.72 25.71 25.80	70.18 70.16 70.28 70.14 70.22 69.86 70.26 70.15 70.29 70.06 70.03 70.07 70.00 70.28	1.605 1.631 1.629
32 33 34 35 36 37 38 39 40	38.51 38.55 38.31 38.42 38.55 38.62 38.51 38.53	55.65	64.27 64.26 64.05 64.21 64.27 64.40 64.24 64.20 64.36	65.46	25.76 25.71 25.74 25.79 25.72 25.78 25.73 25.72 25.83	70.15 70.12 70.00 70.32 70.19	1.614

SHEET 2 of 2

#### Lot PA-E-23880

SHELL	EMPTY	EMPTY SHELL WITH WATER WT	WT AFTER DRILLING	WT AFTER DRILLING WITH WATER	WT OF CHARGE	COMPLETE	DENS
41 42 43 44 45 46 47 48	38.41 38.49 38.56 38.59 38.56 38.46 38.42 38.30	<b>55•</b> 57	64.27 64.23 64.27 64.60 64.31 64.26 64.12 64.05	65•73	25.86 25.74 25.73 26.01 25.75 25.80 25.70 25.75	70.16 70.06 70.22 70.32 70.20 70.12 70.04 70.00	1.641

## Shell, HEP, Comp A3 loaded, 155mm, T152E6 with Fuze, BD, T - Adjustable

SHELL NO	EMPTY	EMPTY SHELL WITH WATER	WT AFTER DRILLING	WT AFTER DRILLING WITH WATER	WI OF CHARGE	COMPLETE WI	DENS
3 6 9 10 11 12 13	47.97 48.25 48.57 47.97 48.48 48.22 47.93	64.42 64.15	71.69 72.15 72.53 71.81 72.15 72.01 71.56	73.40 73.13	23.72 23.90 23.96 23.84 23.75 23.79 23.63	77.55 77.84 78.23 77.71 78.12 77.92 77.62	1.600
14 15 16 17 18 20	47.93 47.72 48.30 48.24 48.13 48.09		71.86 71.82 72.25 72.13 72.19 71.92		23.93 24.10 23.95 23.89 24.06 23.83	77.62 77.69 77.97 77.79 77.92 77.71	
21 22 23 24 25 26 27 28	48.30 47.28 48.25 48.07 48.14 48.29 48.25	63.12	72.08 71.67 72.20 71.88 71.85 72.05 71.90 71.80	72.76	23.78 24.39 23.95 23.81 23.71 23.76 23.65 24.00	77.91 77.06 77.93 77.82 77.82 78.00 77.89 77.54	1.65
29 31 32 33 36 37 38 39 41	48.18 48.24 48.09 48.37 48.12 48.00 48.06 48.12 48.31 47.97	64.12	72.15 71.97 72.02 72.15 72.09 71.65 71.88 72.05 72.23 71.68	73.19	23.97 23.73 23.93 23.78 23.97 23.65 23.82 23.93 23.92 23.71	77.95 77.87 77.78 78.28 77.91 77.73 77.55 77.75 77.96 77.68	1.61
44 45 47 48 50 51 53	48.23 48.12 47.83 47.94 47.29 48.07 47.75 47.98	63.09	72.20 72.18 71.70 71.72 71.63 71.81 71.60 71.90	72.72	23.97 24.06 23.87 23.78 24.34 23.74 23.85 23.92	77.97 77.84 77.48 77.63 77.02 77.65 77.29 77.62	1.65
56 58 59	47.39 47.78 48.25	63.18	71.23 71.74 72.15	72.31	23,84 23,96 23,90	77.02 77.59 77.84	1.62

T. P. R. NO.	Ballmarin EXPERIMENTAL AMMUNITION DATA CARD							NO. 84429 AMM. LOT NO.	
*.								PA-E-2	DI.ARI.
PEC. NO.	Charge, Propelling, T- For 155MM Howitzer, Projectile								Y IN LOT
	HEP-T152E6								53
ORG. NO.	DRG. DATE OR REV.	ALLOT. ADVICE		PROJECT NO.		RAD OR EPO NO.		QUANTITY IN SHIPMEN	
P. A. X. O.	PROP. CHARGE	EXPECTED M. V.		TA1-5002H EXPECTED PRESSURE		APSEMBLED BY		DATE OF ASSEMBLY	
629-176	9 lbs 15 ozs	EXPECTED M. V.		EAFECT	ED PRESSURE	1.0			
		ised, in MIOAl Cartridge storage C			PA PA		January, 1957		
Igniter Pad	s fabricated in 51 and Dwg. 71-9 dimensions: 51	accordance	with [ 3-19-4	Эwg'a'	71–9–180, R	ev. 3-19-4			
COMPONENT	103 -45 6435	Alexander State	Prome	Tlant	Black	· · · · · · · · · · · · · · · · · · ·	-		
	Cloth Silk	Cloth Silk		attent					
KIND	Otg Bag	Ctg. Bag	MI		Powder				
	Class "E"	Class "C"	-		Gr. Al		-		-
DRG. NO.			-				-		-
DRG. DATE OR RI		70 1	T- 44 -		Win Day I		_		-
MFG'D BY	- Jacquoiniata		Unk India		King Pwd I	abor	-		-
DATE			1943 IND-6	222	KPD-1-61	<del> </del>	-		
OT NO.	SMI-15	Unk IND-6		7 000	VLD-T-OT	F. Holl		.7 (24)	
	Ars Opers	DIVISION		LTINNY A ER, NEW		Inspec	ion	NO.	DIVISION
алмү-р.а. DOVER, W. DRDBS-42 7-24-96 8	Baumann EXP	ERIMENTA	L AI	ATINNY A ER, NEW	RSENAL USA JERSEY	Inspect	don D	AMM L	84430 ot no.
аяму-р.а. DOVER, Н. DRDBB-ав 7-44-ве в Т. Р. R. NO.	Ara Opera	ERIMENTA	L AI	ATINNY A ER, NEW	RSENAL USA JERSEY	Inspect	don D	PA-E-	84430 ot no. 24685 ty in lot
ARMY-P.A. DOVER, M. ORDBS-43 7-20-86 B T. P. R. · NO. SPEC NO.	Baumann EXPI KIND Charge, Prop	ERIMENTA	AL Al	MMUN	HITION DA	Inspece	D EP,	PA-E-	84430 ot no. 24685 fy in lot 82
ARMY-P.A. DOVER, M. ORDBS-43 7-20-86 B T. P. R. · NO. SPEC NO.	Baumann EXPI	ERIMENTA	AL Al	MMUN SMM Ho	HITION DA	Inspect	D EP,	PA-E-	84430 ot no. 24685 ty in lot
ARMY-P.A. DOVER, W. ORDBS-43 7-26-86 B T. P. R. NO. SPEC NO.	Baumann EXPI KIND Charge, Prop	ERIMENTA	AL A!	MMUN  SMM Hotelerant	HITION DA	ATA CAR jectile, H	D SP,	PA-E-COUNTIES	84430 ot no. 24685 IV IN LOT 82 IV IN SHIPMEN
ARMY-P.A. DOVER, W. DODDS-43 7-26-86 B T. P. R. NO.  SPEC NO.  DRG. NO.  P. A. X. O.	Ars Opers  Line State  Charge, Prop T152E5  DRG. DATE OR REV.  PROP. CHARGE	ERIMENTA  celling T- F	AL A!	MMUN  SMM Hotelerant	HITION DA	ATA CAR  Jectile, Hi	D SP,	PA-E- QUANTIT  QUANTIT  DATE O	84430 of no. 24685 IY IN LOT 82 IY IN SHIPMEN
ARMY-P.A. DOVER, M. 000000-43 7-26-00 0 T. P. R. 'NO.  SPEC NO.  DRG. NO.  P. A. X. O. 629-176	Ara Opera  Baumann EXPI  KIND  Charge, Prop T152E5  DRG. DATE OR REV.  PROP. CHARGE 9 1bs 5 02s.  Packed: Impro	ERIMENTA  Selling T- F  ALLOT. ADVICE  EXPECTED M. Sovised, in N	NL AN	MMUN SMM Ho  PROJECT TA1-50 EXPECT	HITION DA	Inspection, His section, His se	D SP,	PA-E-COUNTIES  QUANTIES  DATE OF January	84430 ot no. 24685 fy in lot 82 fy in shipmen F Assembly ry, 1957
ARBY-P.A. DOVER, N. ODDB-48 7-20-90 8 T. P. R. NO.  SPEC NO.  DRG. NO.  P. A. X. O. 629-176  REMARKS: Igniter pad Rev. 10-25-	Charge, Prop. T152E5  DRG. DATE OF REV.  PROP. CHARGE 9 155 5 025.	ERIMENTA  celling T- F  ALLOT. ADVICE  EXPECTED M. V  ovised, in M accordance 0-182, Rev. diameter,	For 159  E  U  U  U  U  U  U  U  U  U  U  U  U	MMUN  SMM Ho  PROJECT  TA1-5  EXPECT  Certric  Dwg's  45.  ong.	HITION DA witzer, Pro cr No. DOZH ED PRI SURE dge storage 71-9-180, R Charge weig	Inspection, History and or entropy PA case.	D SP, PO NO. BY	PA-E-  GUANTII  DATE O  Janua:	84430 ot no. 24685 fy in lot 82 fy in shipmen F Assembly ry, 1957
ARMY-P.A. DOVER. N. ODDES-49 7-16-90 0 T.P.R. NO.  SPEC NO.  DRG. NO.  P. A. X. O. 629-176  REMARKS: Igniter pad Rev. 10-25- Charge Bag  COMPONENT	Ara Opera  Ara Opera  KIND  Charge, Prop. T152E5  DRG. DATE OR REV.  PROP. CHARGE  9 1bs 5 02s.  Packed: Improdimensions: 54m  Cloth Silk	ERIMENTA  Selling T- F  ALLOY. ADVICE  EXPECTED M. V  ovised, in M accordance 0-182, Rev. diameter,	COAL (15)	MMUN  SMM Ho  PROJECT  TA1-5  EXPECT  Certric  Dwg's  45.  ong.	HITION DA witzer, Pro tr No. 002H ed par sure dge storage 71-9-180, R Charge weig	Inspective, His rad on El ASSEMBLED PA Case.	D SP, PO NO. BY	PA-E-  GUANTII  DATE O  Janua:	84430 ot no. 24685 fy in lot 82 fy in shipmen F Assembly ry, 1957
ARMIT-P.A. DOVER. N. DOPER-49 7-14-99 8 T. P. R. NO.  SPEC NO.  DRG. NO.  P. A. X. O. 629-176  REMARKS: Igniter pad Rev. 10-25- Charge Bag  COMPONENT	Charge, Prop. T152E5  DRG. DATE OR REV.  PROP. CHARGE 9 1bs 5 02s.  Packed: Improdis fabricated in -51 and Dwg. 71-9 dimensions: 54**  Cloth Silk Ctg Bag	ERIMENTA  Selling T- F  ALLOY. ADVICE  EXPECTED M. V  ovised, in M accordance 0-182, Rev. diameter,  Cloth Silk  Ctg Bag	For 159  E  U  U  U  U  U  U  U  U  U  U  U  U	MMUN  SMM Ho  PROJECT  TA1-5  EXPECT  Certric  Dwg's  45.  ong.	Witzer, Processor No. 2002H de signage 71-9-180, R. Charge weig	Inspective, His rad on El ASSEMBLED PA Case.	D SP, PO NO. BY	PA-E-  GUANTII  DATE O  Janua:	84430 ot no. 24685 fy in lot 82 fy in shipmen F Assembly ry, 1957
ARMY-P.A. DOVER, N. DDDDB-48 7-26-86 8 T. P. R. NO.  SPEC NO.  DRG. NO.  P. A. X. O.  629-176  REMARKS: Igniter pad Rev. 10-25- Charge Bag  COMPONENT	Ara Opera  Ara Opera  KIND  Charge, Prop. T152E5  DRG. DATE OR REV.  PROP. CHARGE  9 1bs 5 02s.  Packed: Improdimensions: 54m  Cloth Silk	ERIMENTA  Selling T- F  ALLOY. ADVICE  EXPECTED M. V  ovised, in M accordance 0-182, Rev. diameter,	COAL (15)	MMUN  SMM Ho  PROJECT  TA1-5  EXPECT  Certric  Dwg's  45.  ong.	HITION DA witzer, Pro tr No. 002H ed par sure dge storage 71-9-180, R Charge weig	Inspective, His rad on El ASSEMBLED PA Case.	D SP, PO NO. BY	PA-E-  GUANTII  DATE O  Janua:	84430 ot no. 24685 fy in lot 82 fy in shipmen F Assembly ry, 1957
ARMIT-P.A. DOVER, N. DROBS-48 7-26-96 8 T. P. R. NO.  DRG. NO.  P. A. X. O. 629-176  REMARKS: Igniter pad Rev. 10-25- Charge Bag  COMPONENT KIND  DRG. NO.	Ars Opers  Lea Baumann EXPI  KIND  Charge, Prop T152E5  DRG. DATE OR REV.  PROP. CHARGE 9 lbs 5 02s.  Packed: Improduce for and Dwg. 71-9 dimensions: 54m  Cloth Silk  Ctg Bag Class "E"	ERIMENTA  Selling T- F  ALLOY. ADVICE  EXPECTED M. V  ovised, in M accordance 0-182, Rev. diameter,  Cloth Silk  Ctg Bag	COAL (15)	MMUN  SMM Ho  PROJECT  TA1-5  EXPECT  Certric  Dwg's  45.  ong.	Witzer, Processor No. 2002H de signage 71-9-180, R. Charge weig	Inspective, His rad on El ASSEMBLED PA Case.	D SP, PO NO. BY	PA-E-  GUANTII  DATE O  Janua:	84430 ot no. 24685 fy in lot 82 fy in shipmen F Assembly ry, 1957
ARMIT-P.A. DOVER, M. DORDBS-48 7-46-90 8 T. P. R. NO.  DRG. NO.  P. A. X. O. 629-176  REMARKS: Igniter pad Rev. 10-25- Charge Bag  COMPONENT KIND  DRG. NO.  DRG. DATE OR RI	Ara Opera  Ara Opera  Line Baumann EXPI  KIND  Charge, Prop  T152E5  DRG. DATE OR REV.  PROP. CHARGE  9 lbs 5 02s.  Packed: Improdis fabricated in -51 and Dwg. 71-9 dimensions: 54m  Cloth Silk  Ctg Bag  Class "E"	ERIMENTA  Selling T- F  ALLOT. ADVICE  EXPECTED M. V  ovised, in N accordance  -182, Rev. diameter,  Cloth Silk  Ctg Bag  Class "C"	OAL AF	MMUN SMM Ho  PROJECT TA1-50 EXPECT Owg's 45. ong.	HIACK POWDER  RESENAL AS A STREET AS A STR	Inspective, History RAD OR EL ASSEMBLED PA Case. ev. 3-19-4:	D SP, PO NO. BY	PA-E-  GUANTII  DATE O  Janua:	84430 ot no. 24685 fy in lot 82 fy in shipmen F Assembly ry, 1957
ARMY-P.A. DOVER, M. DORDS-48 7-46-90 B T. P. R. NO.  SPEC NO.  DRG. NO.  P. A. X. O. 629-176  REMARKS: Igniter pad Rev. 10-25- Charge Bag  COMPONENT KIND  DRG. NO.  DRG. NO.  DRG. NO.  DRG. NO.  DRG. NO.  DRG. NO.  DRG. DATE OR RI	Ara Opera  Baumann EXPI  KIND  Charge, Prop. T152E5  DRG. DATE OR REV.  PROP. CHARGE 9 1bs 5 02s.  Packed: Improdis fabricated in class fabricated	ERIMENTA  Selling T- F  ALLOY. ADVICE  EXPECTED M. V  ovised, in N accordance  -182, Rev. diameter,  Cloth Silk  Ctg Bag  Class "C"	Fropping	MMUN  SMM Hor  PROJECT  TA1-5  EXPECT  Certric  Dwg's  45.  ong.	HITION DA witzer, Pro cr No. DOZH eD PRI SURE dge storage 71-9-180, R Charge weig  Black Powder Gr. A-1  King Pwd	Inspective, History RAD OR EL ASSEMBLED PA Case. ev. 3-19-4:	D SP, PO NO. BY	PA-E-  GUANTII  DATE O  Janua:	84430 ot no. 24685 fy in lot 82 fy in shipmen F Assembly ry, 1957
ARMY-P.A. DOVER, N. DORDS-48 7-16-90 B T.P. R. NO.  DRG. NO.  P. A. X. O. 629-176  REMARKS: Igniter pad Rev. 10-25- Charge Bag  COMPONENT KIND  DRG. NO.  DRG. NO.  DRG. NO.  DRG. NO.  DRG. NO.  DRG. DATE OR RI  MFG:D BY	Ara Opera  Ara Opera  Line Baumann EXPI  KIND  Charge, Prop  T152E5  DRG. DATE OR REV.  PROP. CHARGE  9 lbs 5 02s.  Packed: Improdis fabricated in -51 and Dwg. 71-9 dimensions: 54m  Cloth Silk  Ctg Bag  Class "E"	ERIMENTA  Selling T- F  ALLOT. ADVICE  EXPECTED M. V  ovised, in Maccordance  -182, Rev.  diameter,  Cloth Silk  Ctg Bag  Class "C"  Unk  Unk	Fropo DuPor 1941	MMUN  SMM Hor  PROJECT  TA1-5/ EXPECT  Certric  Dwg's '45.  cong.	Witzer, Product No. 2002F.  ED PRI SURE  dge storage 71-9-180, R  Charge weig  Black Powder Gr. A-1  King Pwd	Inspective, History RAD OR EL ASSEMBLED PA Case. ev. 3-19-4:	D SP, PO NO. BY	PA-E-  GUANTII  DATE O  Janua:	84430 ot no. 24685 fy in lot 82 fy in shipmen F ASSEMBLY ry, 1957
ARMIT-P.A. DOVER, M. DORDON-18 7-ZE-DE B T. P. R. NO.  SPEC NO.  DRG. NO.  P. A. X. O. 629-176  REMARKS: Igniter pad Rev. 10-25- Charge Bag  COMPONENT KIND  DRG. NO.  DRG. NO.  DRG. NO.  DRG. NO.  DRG. NO.  DRG. NO.  DRG. DATE OR RI  MEGID BY	Ara Opera  Baumann EXPI  KIND  Charge, Prop. T152E5  DRG. DATE OR REV.  PROP. CHARGE 9 1bs 5 02s.  Packed: Improdis fabricated in class fabricated	ERIMENTA  Selling T- F  ALLOY. ADVICE  EXPECTED M. V  ovised, in N accordance  -182, Rev. diameter,  Cloth Silk  Ctg Bag  Class "C"	Fropping	MMUN  SMM Hor  PROJECT  TA1-5/ EXPECT  Certric  Dwg's '45.  cong.	HITION DA witzer, Pro cr No. DOZH eD PRI SURE dge storage 71-9-180, R Charge weig  Black Powder Gr. A-1  King Pwd	Inspective, History RAD OR EL ASSEMBLED PA Case. ev. 3-19-4:	D SP, FO NO. SY SIDES. 5	DATE O Janua:	84430 of No. 24685 FY IN LOT 82 FY IN SHIPMEI F ASSEMBLY Try, 1957 -181,

#### JOINT MESSAGEFORM

UMCAL SUCTABLE

SPACE BELOW RESERVED FOR COMMUNICATION CENTER

PRECEDENCE	TYP	TYPE MSG (Check)		ACCOUNTING	ORIG. OR REPERS TO	CLASSIFICA	
ACTION MATI	ноок	MULTI	BINGLE	51200		0	TET ENENC!
CO PICATINNY ARSE	AVI DO	VER F	IJ		,	SPECIAL IN	STRUCTION
OMICANDING GENERAL ABERDEEN PROVING MARYLAND ATTN: ORDBG-DPS-A	GROUND	ALLE	EH)			1111	
NFO: CHAMBERLAIN COR ATTENTION: PR.	P., 100 I. H&	O MILI RMAN	LDRED	ST., WAT	PERLOG, IO./A (MAIL)	414 /14	
1. IT IS REQUEST	ED THA	1 15	T PRO	JGLAN RE	QUEST NO.	411	
E-20 BE AMENDED 45 FO	LLOWS:					7	
A. COMDUCT C	JAP 13 L	Pu Zd	PANE	L FRAGEE	ITATION		
TESTS OF TWO EACH T152	E5 AHD	T152	2E6,	155 MM SI	ELL VITH		
WO MIO7 STANDARD HE	SHELL.						
B. THE REMAI	NING T	152 8	HELL	(TWELVE	-E5 AND		
EIGHT -E6) SHOULD BE F	IRED F	ROM T	ME M	1 HOMITZE	R FOR		
COMPARATIVE MAXIMUM RA	NGE AM	DIS	SPERS:	HTIL NOI	TEN M107		
STANDARD HE SHELL.							
C. COMPLETE	PHOTOG.	RAPHI	C CO	VERAGE, I	CLUDING		
BOUND OF FIRING AND 3H	ELL DE	TONAT	TON,	is requi	RED, ALSO,		
COMPLETE CHEMICAL ANAL	YSIS A	ND Mil	CCHAN	CAL PROP	PERTIES OF	ти иду 1.5.1	7 -4 PM
KUNG TIGER TANK FACE P	LATE.				Mo	нти	YEAR

ORDBB-TE5

W TYPED NAME AND TITLE (Signature, of required)
Mr. T. Clifford/sjm

PM9NE
2069

PAGE 1

PAGE 2

#### JOINT MESSAGEFORM

ECURITY CLASSIFICATION

UNCLASSIFIED

PRECEDENCE	TYPI	E MSG (	Chack)	ACCOUNTING	ORIS. OR REFERS TO		CLASSIFICATION
TION HALL	веек	MULTI	SINGLE	SYMBOL			OR REFERENC
IOM:						SPECIAL	. INSTRUCTIO
CO PICATINGY ARSEMAI	. nov	ng n	.7				
ABERDIEM PROVING GRO	UND		<u> </u>				
2. NOTIFICATION OF	TIME	O₽	TEST	is regue	ESTED SO		
HAT A REPRESENTATIVE MAY	ATT	END.					
3. THE MIOT HE SHET	L AR	E TO	BE .	SUPPLIED	BY YOUR		
ROVING GROUND.							
4. A COST ESTIMATE	TS P	मात्र	RIED.	COST OF	TANTEMPLETAN		
S TO BE CHARGED TO SUB-P					75530-UI-		
O201-O2 AND JOB ORDER NO	. 30	<b>39-</b> 9	9-90	L.			
		•			1		
0 1							
a îi							
						DATE	TIME
				-4.		монти	YEAR
•				BRUTANOI		^	
SYMBOL				(A)-7	4.11.00	4	
ORDBB-TE5					1000	7	
ORDBB-TE5  TYPED NAME AND TITLE (Signature, if required)			L	YPED (or samped)	NAME AND TITLE		
ORDBB-TE5	2	IR. OF 2			R. H. WOOD		I,

#### DEVELOPMENT AND PROOF SERVICES ABERDEEN PROVING GROUND, MARYLAND FIRING RECORD

APPENDIX B

OBJECT OF TEST: Accuracy and Armor Defeating

Evaluation of Shell, HEP, 155mm,

T152E5 and T152E6

DATES OF TEST: 27 Mar thru

25 Jun 1957

FIRING RECORD NO.: P-62648

SHEET 1 OF 6

AUTHORITY: ORDBG-TE5

c) 471/46, TPR No. TE-20 Messageform ORDBG, 471/417

PROJECT NO.: TAL-5002H

PRIORITY: 1B

DEVELOPMENT: ORDTA

W.O. NO.: 332-236-54

#### MATERIEL

For Accuracy and Plate Firing

Howitzer: 155mm, Ml, No. 7.

Carriage: 155mm, MLA1, No. 497.

Recoil Mechanism: 155mm, M6, No. 3089.

For Range Firing

Howitzer: 155mm, M1, No. 2199. Carriage: 155mm, M1Al, No. 497.

Recoil Mechanism: 155mm, M6, No. 3089.

#### AMMUNITION COMPONENTS

- Shell, HEP-T, Inert-Loaded, 155mm, T152E5, w/Fuze, BD, M91A1, Inert-Loaded, w/Live Tracer, Lot No. PA-E-23878.
- Shell, HEP-T, Inert-Loaded, 155mm, T152E6, w/Fuze, BD, M91A1, Inert-Loaded, w/Live Tracer, Lot No. PA-E-23879.
- Shell, HEP, Comp A-3-Loaded, 155mm, T152E5, w/Fuze, BD, T-Adjustable, Lot No. PA-E-23880.
- Shell, HEP, Comp A-3-Loaded, 155mm, T152E6, w/Fuze, BD, T-Adjustable, Lot PA-E-23881.
- Shell, HE, TNT-Loaded, M107, w/supplementary charge, w/Fuze, PD, M51A5, Lot No. WC-31-82.
- Charge, Propelling, T-, for 155mm Howitzer, Projectile, HEP, T152E5, Lot No. PA-E-24685.
- Charge, Propelling, T-, for 155mm Howitzer, Projectile, HEP, T152E6, Lot No. PA-E-24684.
- 8. Charge, Propelling, M4A1, for 155mm Howitzer, Projectile, HE, M107, Lot No. RAD-19612-45.
- 9. Primer, Percussion, Mk2A4, 19 grains, Lot No. PA-6-47.

#### COIL DISTANCES

ROUNDS 1-4

26 March

Muzzle to 1st Coil

49.32 feet 75.0 feet

Between Coils

		FIRING RECORD NO. P-62648 SHEET 2 OF 6
Politing	COIL DISTANCES (Contd.)	
ROUNDS		
5 <b>-</b> 8	Muzzle to 1st Coil	51.0 feet
	Between Coils	73.24 feet
All rounds	27 March Muzzle to 1st Coil	53.25 feet
	Between Coils	72.0 feet
1-4	28 March Muzzle to lst Coil Between Coils	54.30 feet 70.50 feet
5 & 6	Muzzle to 1st Coil	54.41 feet
) & U		
\	Between Coils	70.90 feet
7-14	Muzzle to 1st Coil	54.32 feet
	Between Coils	76.1 feet
15 <b>-</b> 17	Muzzle to 1st Coil	54.76 feet
	Between Coils	70.20 feet
All rounds	Muzzle to 1st Coil Between Coils	53.7 feet 60.34 feet
	ll April	
All rounds	Muzzle to 1st Coil	50.57 feet
	Between Coils	60.8 feet
All rounds	27 April Muzzle to 1st Coil Between Coils	51.4 feet 48.96 feet
All rounds	4 May Muzzle to 1st Coil Between Coils	49.47 feet 50.04 feet
All rounds	25 June Muzzle to 1st Coil Between Coils	79.28 feet 29.98 feet

PRESSURE GAGE DESCRIPTION

Type of Gage: Medium Caliber (M3) Copper Cup

Crusher Cylinder: Copper metal of 1955, annealed 1956, Lot 7-C

Position in Tube: One on each side of charge.

	ARMOR PLATE DATA 8-INCH PLATE 120" X 120"	BR	INELL
PLATE NO. 070960 14073	CHARPY @ -40°F. 71.71 62.00/81.00	TOP 225 241	BOTTOM 248 241
14001-2 14063-1	7-INCH PLATE 120" X 120" 103.77/91.46 57.00/34.00	235 229	2 <b>32</b> 229

NO. P-62648	TIDE	3	DEPTH (Sec.)		7/2	1961	3/4 10566		Bot taken	Not taken	Not taken	1947		3/4 .194	19531		5/8 -1961	Not taken	Fot	1/2 Not taken	Not taken	Not taken	Not taken		1/2 Not taken	A Hot taken	Not taken	e e	**	10	,	3/4	3/4		1/4	1,0	1/2	1/2	1/2	3/4	3/4	2/4	
FIRING RECORD NO. SHENT 3 OF 6		OF SPALL	BOR. VERT. DE	× 10 1/2 × 1	x 12 1/6 x	12 1/2 x 12 3/8 x 2	x 12 1/2 x 1		:	;	:	:	1/2 × 11 3/16 x 2/1	K 13	:		12 1/2 x 11 x 1	x 17 1/2 x		12 3/4 x 9 x 1		3/4	24	11 × 10 1/2 × 2	×	×		С н Н	4 3	01/4 4 0 4/5 40	3 1/2 x 11 1/2 x 3		3/4 X	4 1/2 x 10 1/2 x 2	×	3 1/h x 10 1/h x 2	O X	1/2 x 11 x 2/2	1/2 x 2	13 3/4 x 12 1/2 x 2	8 x 22 x 6		31/4 x 51/8 x 2
		ASUREMENT	HOR. VERT. LEPTS	x 11 x 91/6	x 12 3/4 x 13/16	21/51 x 41 x	x 14 x 7/8	10 x 12 x 7/8	x 22 x	16 x 13 x 3/4	1/5 x 2/1 21 x 2/1 41	•	T N	T/# x T# x 1/0	:		13 × 12 × 3/4 1	×	-	11 x 10 x 3/4 11	**	x 12 x 3/4	× 11 × 1/2	in the state of th	H H	x 10 x 3/4	67 1	11 x 11 1/2 x 1 1/4 10	0/4 4 4 1/2 37 4	2 12 1/2 x 1 1/2	x 13 1/2 x 1 1/8	x 15 x 1 1/2	x 16 x 3/4	x 16 x 1 1/4	x 15 x 1	x 16 x 1 1/2	x 15 x 1 1/k	x 16 x 11/6	12 x 16 x 1 1/4 1	12 x 16 x 11/8 1	x 15 x 1/8	x 13 x 2	x 61/4 x 7/8
F 400 PER		and andered	SPALL	به ا							겁			22	NODE	Home	Complete	Complete		ete		_				45		Complete															Complete
ROUTH-ET-ROUTH DATA OF FLATS FINDING AT 400 FEET		Property on	ILINCI DE O	0	0	0	0	8	8	8	3	0 (	0 0	<b>&gt;</b> 0	0 0	<b>D</b> (	<b>3</b>	<b>5</b> (	э.	0 (	0	0	0	0 (	<b>5</b>	0 0	<b>5</b> 6	0 0	0 0	0	99	90	8	\$	8	8	8	8	8	8:	4:	#:	1
8	DIA.	5	Ė	8	0	æ	œ	80	0	80	100	20 0	0 0	0 0	0 0	0 0	00	n a	0	00	<b>10</b>	0	10 0	D) (I	0 0	E) 41	0 0	<b>o</b> a	) 30	(C)	<b>[~</b>	٢	<b>t</b> -	<u>~</u>	~	<b>(</b>	1	P	P~-	t \	۵	٥.	0
-BY-ROLED DAY		SPALL.	(fpe)	75%	8	SH.	None	None	None	Home	Notice	8.1	X.		anon	none.	8	HOL TAXAB	Not theen	Not taken	Not taken	Met taken	Not taken	Not taken	Not taken	Not taken	Not taken	Not taken	Not tellen	Not taken	471	395	370	Not taken	Not taken	Not taken	Not taken	Not taken	419	Not taken	10	HOL LEKES	No. Caken
ROUM	dies seemed	CHARGER	pe1/100	277	278	STE	370	Z,	315	277	88	A.	4 8	200	8 8	16	6/2	3	8	9	200	301	00	999	0 0	312	7 9	500	25	Š	282	305	278	387	279	331	283	282	8	800	9	88	9
	Company and an arrange	STATES	(fps)	1786	1798	1624	1838	1800	1812	1823	1853	1791	200	1006	1000	thor.	3.7	Tool	SOCT.	1014	1613	1815	1012	1922	1900	1816	2000	Sylve 10th	1037	0461	1772	1799	1799	1810	1321	1831	1826	1853	1882	1830	1005	367	FOT
	-	THE THINKEY	(cps)	1815	1827	1850	1865	1836	1838	1852	1882	1024	1020	200	000	200	1201	1507	150	Office	1040	1540	Teor	Day of	1039	1875	Charle	555	1986	1967	1796	1801	1824	182	1848	1855	1853	1878	1910	1915	1000	1912	1363
	63	and the same	(1bs.)	72.0	77.0	78.5	78.0	78.5	0.6	7.0	0	25.0	( t )	0.5	2.5	600	4	(0.5)	9	500	0.1	10.5	0.77	10.5	2.5	100	11.0	7.1.0	71.0	78.5	70.5	78.5	2.5	19.0	20.5	78.5	20.5	78.5	5.5	76.5	0.0	0.0	
	PROJECTILE	,	TEPE																																					8			
	- 9	10	90	80	12	2	8	15	R	8	8	e,	N. S	¥ 10	4.5	A.	9 1	5:	7	21	2	8	N I	3.4	<b>d</b> :	7.7	17	8 9	27	15.	17	53	53	o	#	ĸ	5	,	&	13	91	ጸያ	-
	,		30.								10				e i	^	0 1																							11:			
		1036	36.	1508	\$500	4510	4511	4512	4513	4514	4515	4516	4514	0764	177	120	4521	25	1743	125	1555	28	126	1250	4569	4230	45	7,7	16.34	1535	4536	1,537	4538	1539	4540	4541	4542	4543	454	250	4740	1747	4540
		DATE	(1957)	N Mar								Z Mer									P		2					S															
	B-3 CONFIDENTIAL																																										

FIRING RECORD NO. P-62648 SHEET 4 OF 6

ACCURACY ROUND-BY-ROUND FIRING DATA													
TUBE I	EST	PI	ROJEC'	TILE	INST	RUMENT	CHAMBER	ELEVA-	TARGET	MEAS.	OF		
RD. H	RD.	RD.		WEIGHT		CITY	PRESS.	TION	(in		FLIGHT		
	ю.	NO.	TYPE	(lbs.)	(1)	os)	psi/100	mils	VERT.	HOR.	(sec.)		
10 Apr	·il			14					*1				
4549 3	34 *	A	<b>E</b> 5	70.50	Not	taken	291	32					
4550 1		В	E5	70.91		taken	294	28					
4551 4		C	E5	70.49	Not	taken	293	26					
4552 3		D	<b>E</b> 5	70.56		taken	293	24					
	31 *	E	<b>E</b> 5	70.71		taken	296	22					
	1 *	F	<b>E</b> 5	70.53		taken	293	18					
	9 *	G	E5	70.57		taken	287	18	206 2 10	/07	- 0000		
	7	1	E5	70.59		304	282	18	+26 1/2	f21	1.80366		
4557 4558 4	3 8	2	E5	70.20 70.66		310 305	281 284	18 18	£26 1/2	<del>/24</del>	1.79962		
	8	3 4	<b>E</b> 5	70.69		306	290	18	-17 1/2 -27 1/2	<b>√31</b> √31	1.80115 1.80276		
	4		E5	70.07		312	285	18	+15	-9	1.79531		
	4	5	<b>E</b> 5	70.57		303	291	18	£26 1/2	<del>/</del> 2	1.80983		
	2	7	E5	70.73		306	289	18	<i>f</i> 17 1/2	f4 1/2	1.80254		
	8	8	<b>E</b> 5	70.59	18	308	289	18	<del>/</del> 23	<del>/</del> 6	Lost		
	.0	9	E5	70.68		303	286	18	<i>+</i> 18	<i>f</i> 7 1/2	1.80988		
4565 2		10	<b>E</b> 5	70.75		309	290	18	/37 1/2	-12 1/2	1.80170		
4566 3		1	E5	70.45		308	280	18	<i>†</i> 27 1/2	-6 1/2	1.80223		
	9	2	<b>E</b> 5	70.56		309	288	18	<del>/</del> 54	-36	1.80150		
4568 2		3	E5	70.45		317	290	18	<del>/</del> 22 1/2	-18	1.79374		
4569 1 4570 2		4	E5	70.57		317 310	303	18	/41 1/2 /25 1/2	-27 1/2	1.79220		
4571 4		5 6	E5 E5	70.66 70.47		312	294 291	18 18	/35 1/2	-3 1/2	1.79830		
4572 1		7	E5	70.34		316	298	18	/ 3 1/2 /16 1/2	-45 -51	1.79729 1.79370		
4573 4		8	E5	70.57		808	286	18	/43 1/2	-42	1.80150		
4574 4		9	E5	70.56		313	287	18	<i>†</i> 27 1/4	-47	1.79880		
4575 2		10	E5	70.55		311	287	18	+64	-35	1.79993		
4576 4		1	E6	77.16		127	314	18	-49 1/2	-62 1/2	1.76341		
4577 4	9	2		78.15		119	315	18	-33 1/2	-12	1.77006		
	1	3	<b>E</b> 6	77.71		324	316	18	-40 1/2	<del>/</del> 13	1.76532		
4579 6		4	E6	78.12		326	318	18	-26	-3 1/2	1.76278		
4580 5		5		76.80		35	307	18	-41	-6 1/2	1.75500		
4581 3 4582 5	7	7		78.24 77.37		321 330	316 309	18 18	-34	-50 1/2	1.76988		
4583		8		78.23		821	308	18	-33 -17	-25 -17	1.75801 1.76939		
4584 6		9	<b>E</b> 6	77.06		34	308	18	-28	-19 1/2	1.75622		
4585 3		10	<b>E</b> 6	78.18		17	316	18	<b>-</b> 39	-32 1/2	1.77089		
4586		11	<b>E</b> 6	78.44		17	308	18	-38	-35	1.77285		
11 Apr										<b>5</b> ,			
4587 2		H	E5	70.83	18	311	290	18	<i>f</i> 17	<i>f</i> 18 1/2	1.79972		
4588 3	0 *	I	E5	70.74	18	107	293	18	<del>/</del> 2 1/2	0	1.80328		
4589 2	4	1	E5	70.69		10	294	18	<i>†</i> 23	<i>†</i> 2	1.79820		
4590 1		2		70.79		109	294	18	/11	<i>f</i> 18	1.80071		
4591 4		3		70.59		807	294	18	<del>/</del> 19 1/2	fg 1/2	1.80211		
4592 1		4		70.48		12	294	18	<i>f</i> 17	<del>/</del> 8	1.79637		
4593 4		5	E5 .ng Ro	70.59	TC	305	286	18	-18	/13	1.80523		
* UO	TOT	TOUT	TIR MC				B-4	,					

No. P-62648			<u> </u>	HOR.	:	75	13	13	75	:	:	:	13 1/4	11 1/2	13	11 1/2	11	;	11 1/2	80		7 1/2		ulge		Rds. 3 & 7.	8 3/4	0	Rds. 6 & 8.
D No.	9	. 1	IR (10.	DEPTH	8	2 1/4	2 1/2	2 1/2	2 1/4	;	1	i	1 3/4	2	1 3/4	N	2	:	1 3/4	CV		1 3/4	2/12	cked by		etween	2	cu	etveen
FIRING RECORD		VEASUREMENT OF SPALL	REZ	VERT.	:	2	73	13	13 1/4	;	ì	ł	33 1/2	E	12 1/2	10 1/2	18 1/2	:	10	ដ		œ	9	340° cra		Impacted between Rds	OT	10 1/2	Impacted between
FI	SH	SUREMEN		HOR.	1	ट/र टा	13	21	13	1	:	1	13 1/4	13 1/4	13 1/2	12	27		13	97		ส	2/1 21	75			27	2/1 11	6
		MEA	TONT (1D.	DEPTH	•	1/4		_	3/4	í	i	:	3/4	3/4	3/4	3/4	1/1	:	3/4	3/4		3/6	3/4	3/4			3/4	3/4	3/4
				AERT.	1	cų.	3 1/2	m	2	1	8 8	1	m	m	2	2	-4	:	. 2	9		2	5 1/2	15			2	2	en
8				-		H	-	H	a				-	H	7	a	7	9	7	a		H	H	7			H	H	7
IG 1000 YARDS		TYPE	OF	SPALL	1	Complete	Complete	Complete	Complete	None	;	!	Complete	Complete	Complete	Complete	Complete	fissed plat	Complete	Complete	Hit base	Partial	Complete	Partial	None	None	Complete	Complete	None
I'E FURD	DINCHER	JO.	OBLIQ-	LIZIO	0	0	0	0	0	0	0	0	0	0	0	0	#	8	8	8	8	8	8	8	8	8	8	8	8
OF PLA	DTA.	JO.	PLATE	(1n.)	ထ	80	00	œ	80	æ	0	0	Ø	00	œ	00	9	-	7	7	7	۲	-	_	_	-	<u>-</u>	<u>-</u>	_
NOUND DATA		CEAMBER	PRESSURE	pe1/100	283	319	300	83	S	375	900	305	303	862	530	8 K	162	જ્ઞ	38	301	307	303	299	302	301	8	352	301	303
ROUND-BY-ROUND DATA OF PLATE FIRING 1000		TELOCITY (fps)	STRIKING	SPALL	Missed plate	681	682	<b>28</b>	723	Low order	Fell short	Hit base of plate	Lost	<b>a</b>	985	Not taken	Not taken	Not taken	Not taken		Not taken	Not taken		Not taken	Low order	Low order	Low order	Low order	Low order
		VE	INSTRU	MENT	1815	1819	1830	1819	1880	1825	1823	1829	1823	1820	1824	1821	1823	1810	1818	1820	1818	181	Lost	1817	1823	1818	1823	1812	1824
		11.5	WEIGHT	(1bs.)	71.0	78.5	71.5	78.5	71.0	6.8	77.0	78.5	71.0	78.5	0.4	0.8	71.0	70.5	78.0	77.0	78.5	71.0	78.15	7.0	78.5	7.0	78.5	71.0	78.0
		PROTECT																			8								
		D.	5	No.	-	CV	ന	-4	5	0	-	00	6	9	Ħ	12	23	H	N	m	4	5	9	-	00	0	2	Ħ	2
		-																			ส								
		TUBE	30.	NO.	459	4595	4596	4597	4598	4599	0094	1094	1602	1603	1604	1605	9094	109	1608	6094	0194	1611	4612	4613	4614	4615	9194	1617	4618
			DATE	PIRED	27 Apr													4 May		,									

B-5

FIRING RECORD NO. P-62648 SHEET 6 OF 6

#### MAXIMUM RANGE AND DISPERSION ROUND-BY-ROUND DATA - TUBE NO. 2199

									TIME	ORDER
TUBE	PROJEC	CTILE			MUZZLE			MEAS.	OF	OF
RD.		WEIGHT	CHARGE	PRESS.	VELOCITY	DEFLE	CTIONS	RANGE	FLIGHT	DETO-
NO.	TYPE	(lbs.)	LOT	psi/100	(fps)	mils	yards	yards	(sec.)	NATION
1183	MIO7	95.1	MHAL	312	1839	21.9	344	16036	59.75	HO
1184	ML07	95.1	MHAL	305	1836	22.4	349	15917	59.54	HO
1185	MIO7	95.1	MAAL	313	1835	21.9	342	15944	59.55	HO
1186	M107	95.1	MAAL	326	1.843	20.6	321	15909	59.56	HO
1187	ML07	95.1	M4Al	316	1842	21.0	329	15971	59.52	HO
1188	MI O7	95.1	MHAL	314	1842	21.5	333	15810	59.37	HO
1189	MILO7	95.1	M4Al	323	1827	21.9	341	15879	59.46	HO
1190	ML07	95.1	MHA1.	322	1842	22.6	352	15887	59.58	HO
1191	M107	95.1	MAAL	318	1836	22.7	354	15931	59.55	HO
1192	M107	95.1	MHAL	310	1825	21.2	330	15901	59.17	HO
	T152E5	71.0	PA-E-24685	326	1827	41.3	455	11252	52.38	HO
	T152E5	71.0	PA-E-24685	318	1829	40.0	446	11365	52.45	HO
	T152E5	71.0	PA-E-24685	314	1830	40.5	450	11338	52.18	HO
	T152E5	71.0	PA-E-24685	<b>3</b> 19	1826	41.3	459	11332	52.33	HO
	T152E5	71.0	PA-E-24685	324	1828	39.6	442	11400	52.11	HO
1198	T152E5	70.5	PA-E-24685	322	1826	40.3	447	11307	52.05	HO
	T152E5	71.0	PA-E-24685	323	1828	42.4	463	11150	52.12	HO
1200	T152E5	71.0	PA-E-24685	320	1825	41.6	463	11350	52.18	HO
1201	T152E5	71.0	PA-E-24685	304	1823	42.9	472	11223	52.19	HO
	T152E5	70.5	PA-E-24685	315	1827	42.5	465	11159	52.01	НО
	T152E5	71.0	PA-E-24685	314	1829	41.9	463	11277	52.21	HO
	T152E5		PA-E-24685	321	1835	36.7	413	11471	52.58	Failed
1205	T152E6	78.5	PA-E-24684	296	1834	41.0	476	11852	53.30	HO
1206	T152E6	78.5	PA-E-24684	313	1824	42.6	493	11818	53.10	HO
	T152E6	78.5	PA-E-24684	293	1831	42.4	490	11803	53.14	HO
	T152E6	78.5	PA-E-24684	299	1828	41.3	481	11873	53.13	HO
	T152E6	78.0	PA-E-24684	301	1829	42.2	489	11833	53.21	HO
1210	T1.52E6	78.0	PA-E-24684	302	1834	40.7	477	11969	53.20	HO
	T152E6	78.0	PA-E-24684	304	1835	44.3	514	11839	53.20	HO
1212	T152E6	78.5	PA-E-24684	307	1830	42.6	498	11931	53.30	HO

NOTE: Deflection measured to right of line of fire. Range measure from muzzle to point of impact. ... HO = High Order

This firing record forms a part of the Seventh Report on Ordnance Corps Project No. TA1-5002H.

APPROVED:

H. A. BECHTOL

Chief, Artillery

Division

H. B. ANDERSON

Chief, Artillery

Ammunition Branch

RALPH H. ALLEN

Proof Director

CONFIDENTIAL

& ABERDEEN PROVING GROUND &

28 March 1957

Project No. TA1-5002H/TE20. Accuracy and Armor Defeating Evaluation of Shell, HEP, 155mm.

Open shutter photograph of Shell, HEP, 155mm, T152E6, striking 7 inch plate at 60 degrees obliquity.

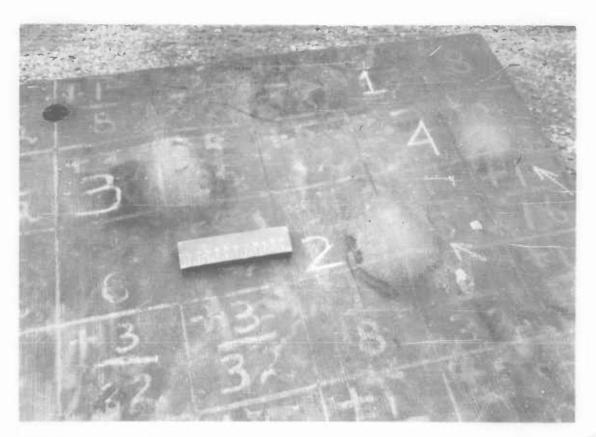


& ABERDEEN PROVING GROUND & 429Pn CONFIDENTIAL

28 March 1957

Project No. TA1-5002H/TE20. Accuracy and Armor Defeating Evaluation of Shell, HEP, 155mm.

Open shutter photograph of Shell, HEP, 155mm, T152E5, striking 7 inch plate at 60 degrees obliquity.



B24568: Rear of 8 inch armor plate fired at 60 degrees obliquity, showing bulges. Bulges 1 and 2 were caused by T152E5 HEP Shell. Bulges 3 and 4 were caused by T152E6 HEP Shell. Distance from muzzle to plate center - 401.24 feet. Charpy value of plate - 62/81, Bhn 241.



B24567: Face of 8 inch armor plate at 60 degrees obliquity. Note cracks on edge of plate adjacent to Round 1 which extend to face of plate.

C-4 CONFIDENTIAL



B24566: Photograph of Shell, HEP, 155mm, T152E5, with charge.

C-5 CONFIDENTIAL



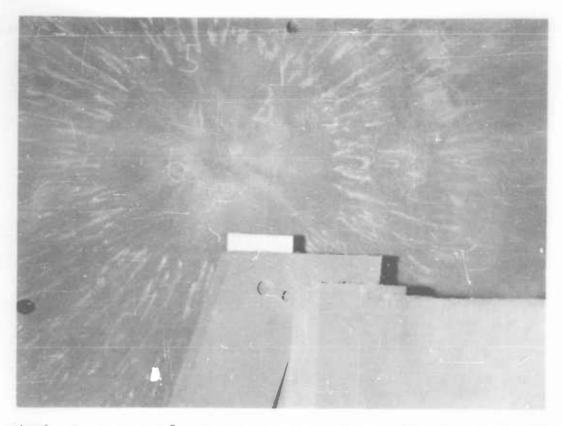
B24565: Photograph of Shell, HEP, 155mm, T152E6, with charge.

c-6
CONFIDENTIAL



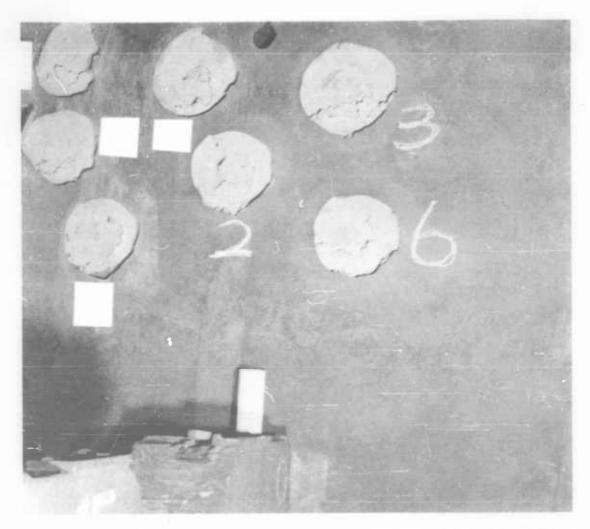
B24577: Side view of 8 inch plate at 0 degrees obliquity, showing depths of back spalls. Rounds 7 through 16. Note: back spall, Round 14, is a double spall.

C-7 CONFIDENTIAL

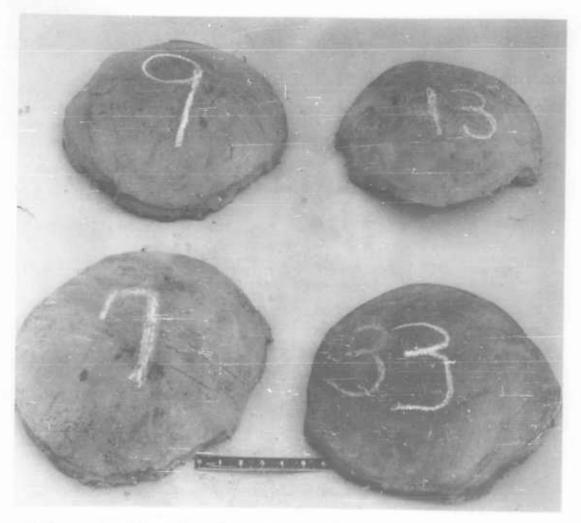


324576: Front view of 8 inch plate fired at 0 degrees obliquity, showing hits. Rounds 1 through 6. Rounds 1, 3, and 4 failed to function and were low order due to bad fuzes.

C-8



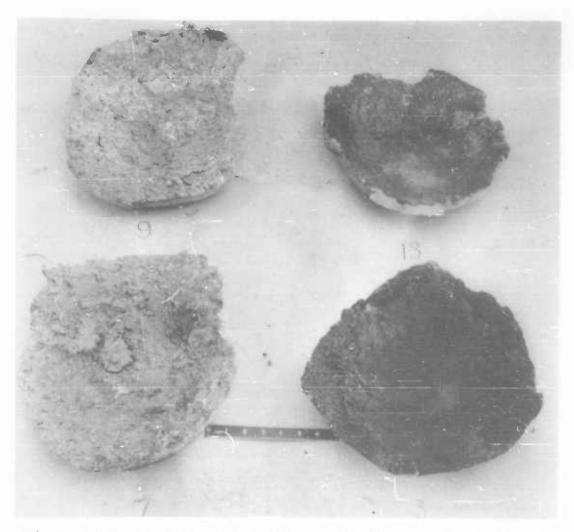
B24575: Rear of 8 inch plate fired at 0 degrees obliquity, showing back spalls from Rounds 1 through 6. Rounds 1, 4, and 5 did not spall as fuze failed to function.



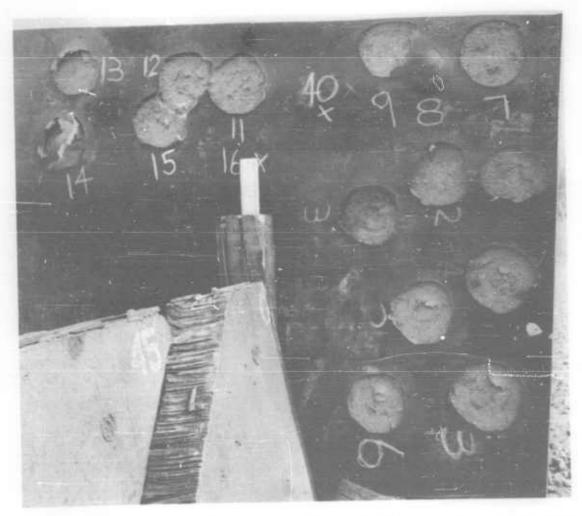
B24574: Front view of four back spalls. Weight of spalls - No. 3 - 48 lbs., No. 7 - 63 lbs., No. 9 - 38 lbs., No. 13 - 27 lbs. 8 inch plate fired at 0 degrees obliquity. Distance from muzzle to plate center - 401 feet.



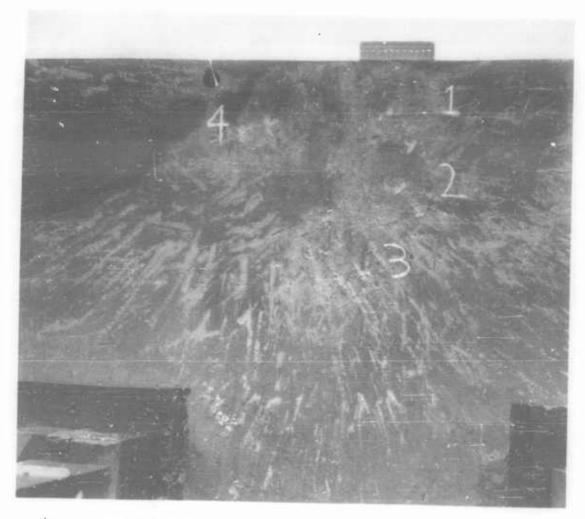
B24573: Front view of 8 inch plate fired at 0 degrees obliquity, showing hits. Rounds 7 through 16. The depth of impressions from the bits average 3/4 inch in depth.



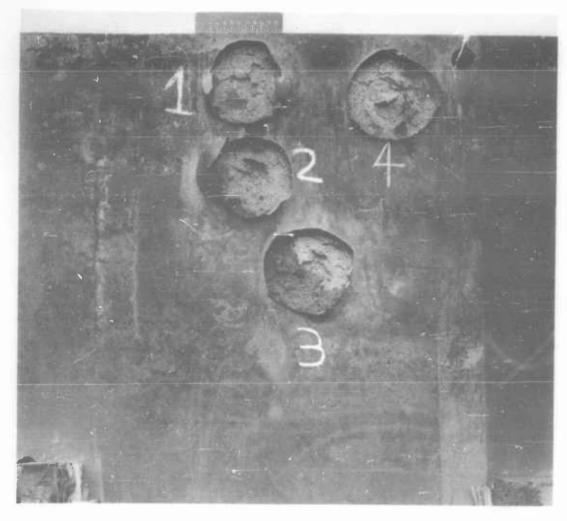
B24572: Rear view of four back spalls. Weight of spalls: No. 3 - 48 lbs., No. 7 - 63 lbs., No. 9 - 38 lbs., No. 13 - 27 lbs. 8 inch plate fired at 0 degrees obliquity. Distance from muzzle to plate center - 401 feet.



B24571: Rear of 8 inch armor plate fired at 0 degrees obliquity, showing back spalls from Rounds 7 through 16. Round 8 resulted in a bulge. Round 10 gave no spall due to fuze failure. Charpy value of plate - 71/71, Bhn 225/248. Distance from muzzle to plate center - 401 feet.

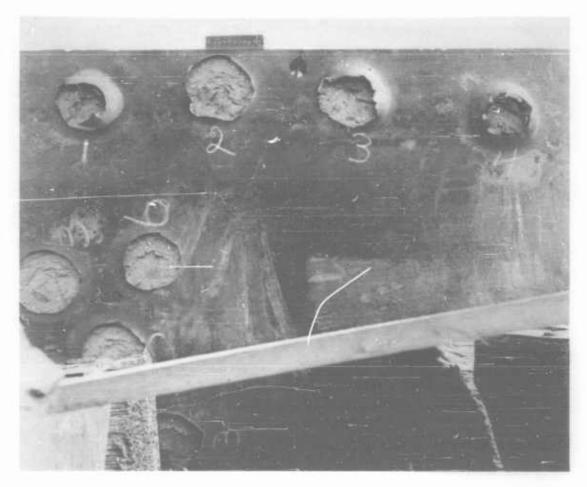


B24570: Face of 8 inch armor plate fired at 0 degrees obliquity, showing location of four hits.

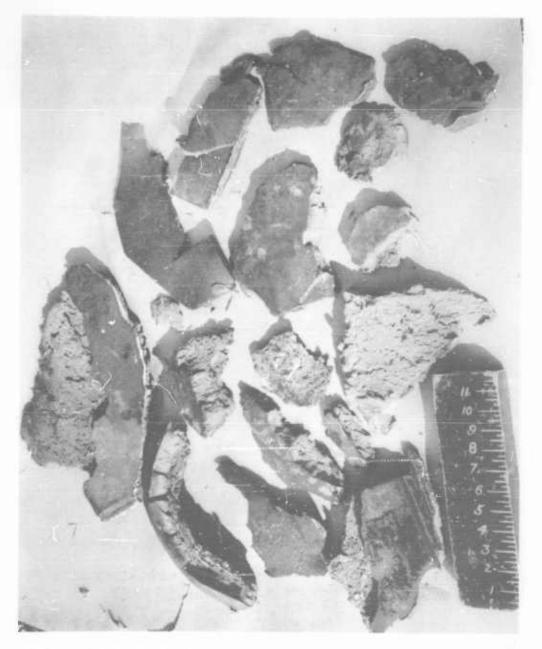


B24569: Rear of 8 inch armor plate fired at 0 degrees obliquity, showing size of back spalls. Spalls 1 and 2 were caused by Shell T152E5. Spalls 3 and 4 by Shell T152E6. Charpy value of plate - 71/71, Bhn 225/248. Distance from muzzle to plate center - 401 feet.

C-15 CONFIDENTIAL



B24587: Rear view of 8-inch plate fired at 0 degrees obliquity, showing back spalls of Rounds 1 - 4. Number 1 and 3, were hit by T152E5 Shell, Number 2 and 4, T152E6. Charpy value of plate 71/71, BHN 225/248. Distance, muzzle to plate center - 401 feet.



B24586: Photograph of back spall pieces from Round 15 on King Tiger Hull (German). Weight of pieces - 87 lbs.

C-17

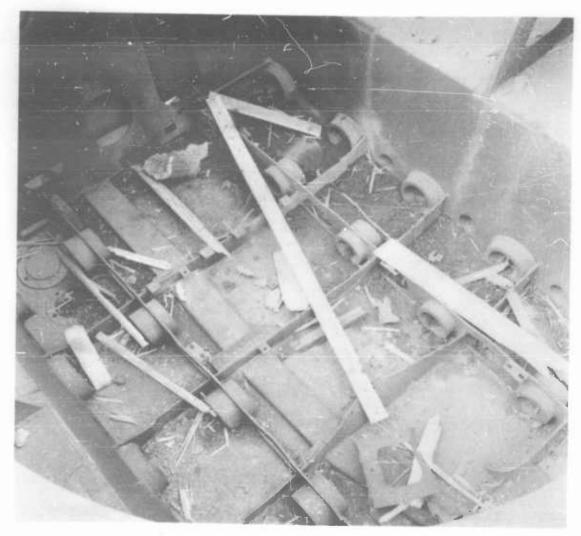


B24585: View of hits on King Tiger Hull (German) frontal armor plate. Plate 6 inches thick, 44 degrees obliquity. Arrows indicate broken welds. Distance, muzzle to center of plate - 402 feet.



B24584: Three-quarter right front view of King Tiger Hull (German), showing depths of hits. Arrows point to broken welds. Right frontal side suffered similar weld breaks.

C-19

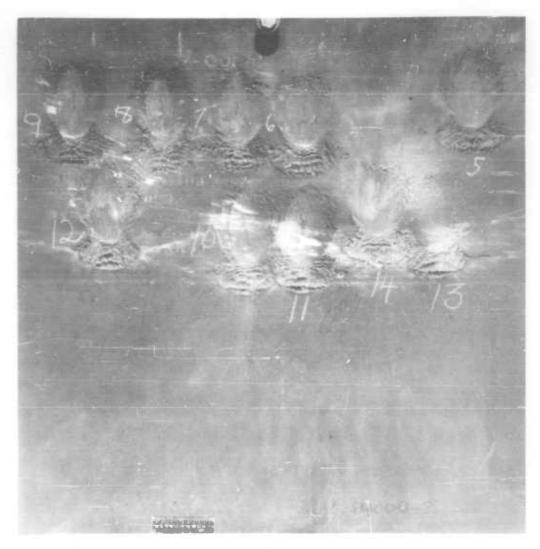


B24583: Interior of King Tiger Hull (German), showing damage caused by back spalls. Three frontal hits.

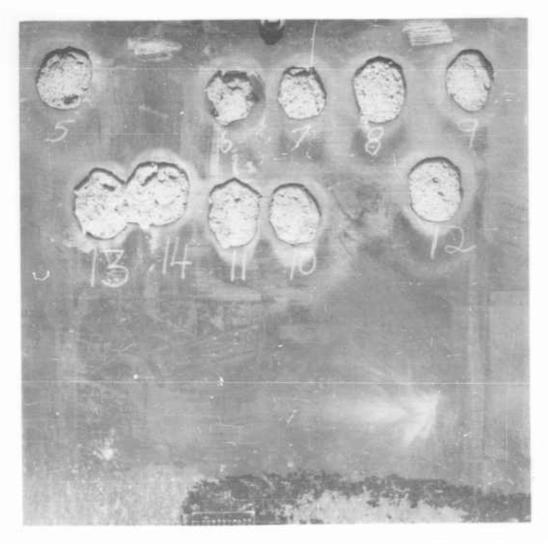


B24582: Rear view of 6-inch frontal plate, showing three hits from 155mm HEP Shell. Hit No. 3 was at junction of two 6-inch plates. Arrows point to broken welds and cracks.

C-21



B24581: Front view of 7-inch plate fired at 60 degrees obliquity, showing imprints of hits. Rounds 5 and 6 were fired muzzle to plate center 241 feet. Rounds 7 - 14, muzzle to plate center - 400 feet.

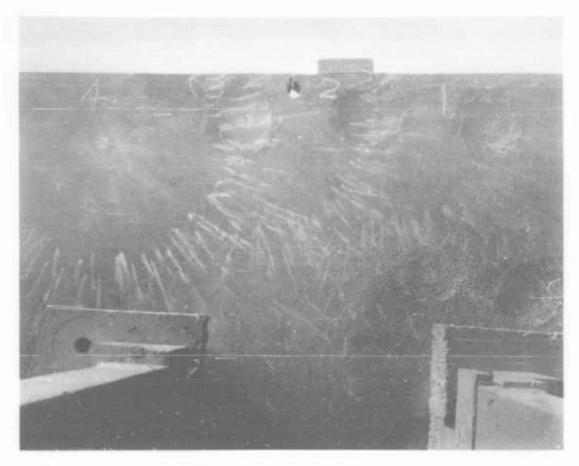


B24580: Rear view of 7-inch plate fired at 60 degrees obliquity, showing back spalls from Rounds 5 - 14. Rounds 5, 7, 9, 11, and 13 were T152E5. Rounds 6, 8, 10, 12, and 14 were T152E6. Charpy value of plate - 57/34, BHN 229.



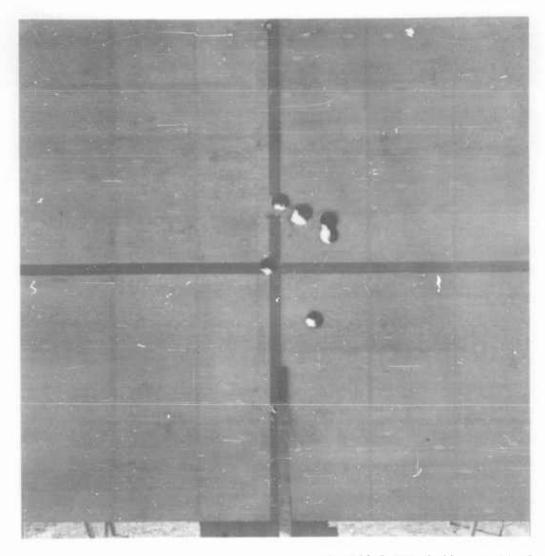
B24579: View of back spalls from 7-inch plate fired at 60 degrees obliquity. Distance, muzzle to center of plate - 400 feet. Average weight of spalls - 51 lbs.

C-24 CONFIDENTIAL



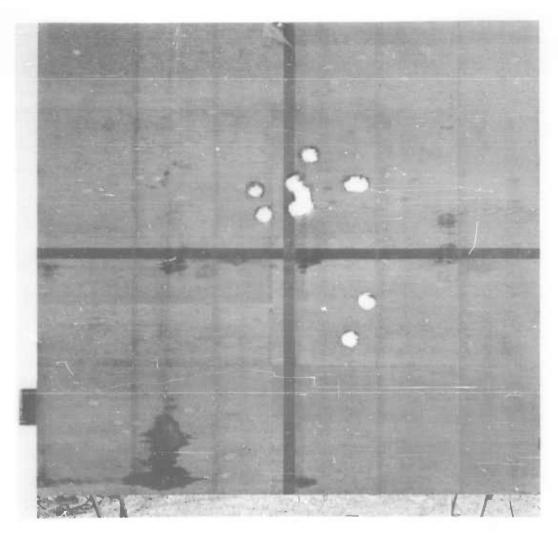
B24578: Front view of 8-inch plate fired at 0 degrees obliquity, showing four hits on plate. Depth of hits average 1 1/4 inches.

C-25



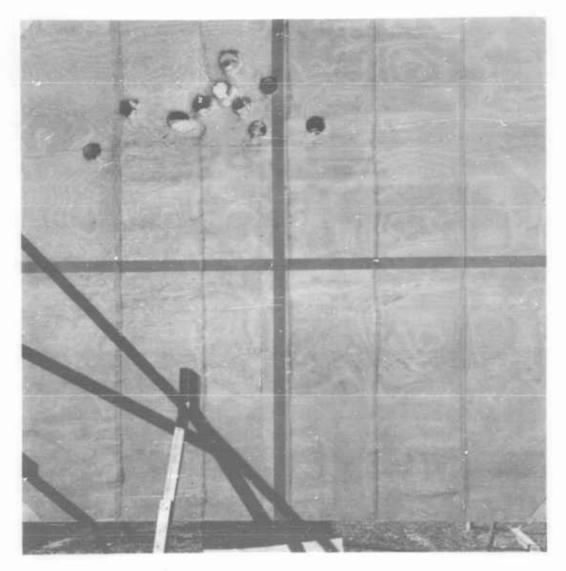
B22001: Hits on 1000 yard accuracy target with T152E5 HEP Shell. Vertical PE .31 mils reduces to .09 omitting round in lower right hand quadrant. Lateral PE .11.

C-26



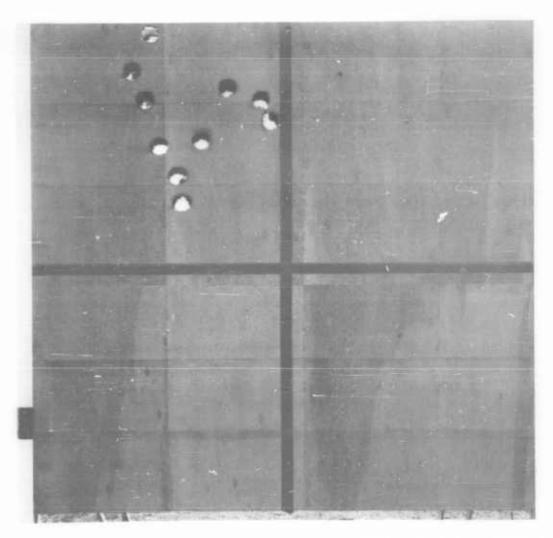
B22002: Hits on 1000 yard accuracy target with T152E5 HEP Shell. Vertical P.E. .39 reduces to .13 omitting two rounds in lower right hand quadrant. Lateral P.E. .27 mils.

C-27 CONFIDENTIAL



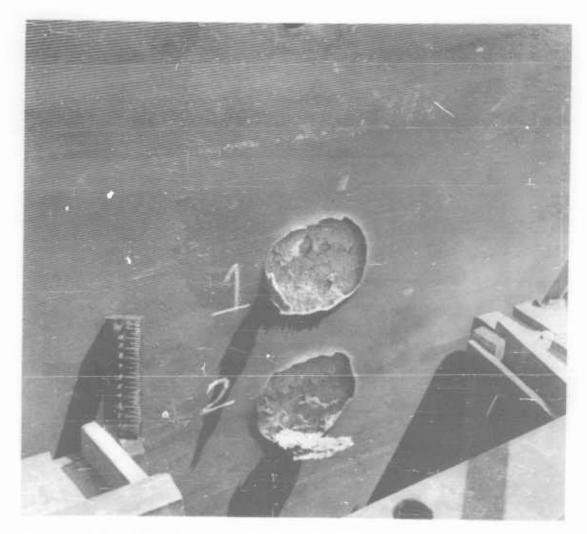
B22003: Hits on 1000 yard accuracy target with T152E6 HEP Shell. Vertical P.E. .14 mils. Lateral P.E. .34 mils.

C-28
CONFIDENTIAL



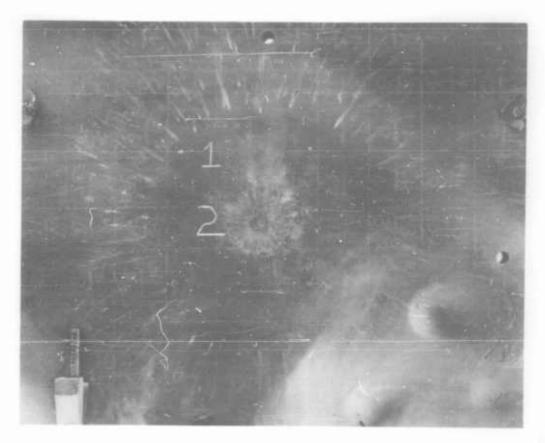
B22004: Hits on 1000 yard accuracy target, with T152E5 HEP Shell. Vertical P.E. .34 mils. Lateral P.E. .32 mils.

C-29 CONFIDENTIAL



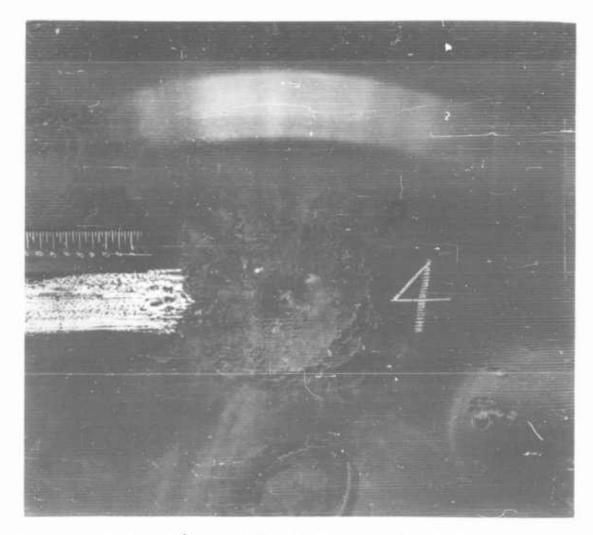
B22005: Rear view of 8-inch plate fired at 1000 yards, zero degrees obliquity, showing back spalls from Rounds 1 and 2. Round 1, T152E6; Round 2, T152E5. Charpy value of plate - 62, BHN 241. Depth of spalls average 2 1/4 inches.

C-30 CONFIDENTIAL



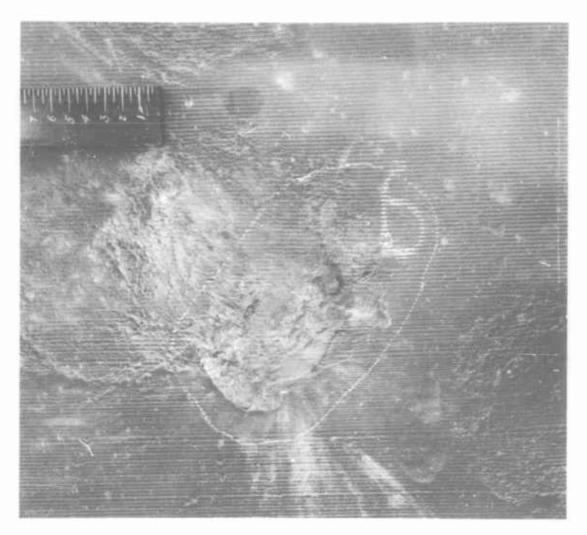
B22006: Front view of 8-inch plate fired at 1000 yards, zero degrees obliquity showing first hits on plate. Depth of hits average 1 1/8 inches.

C-31
CONFIDENTIAL

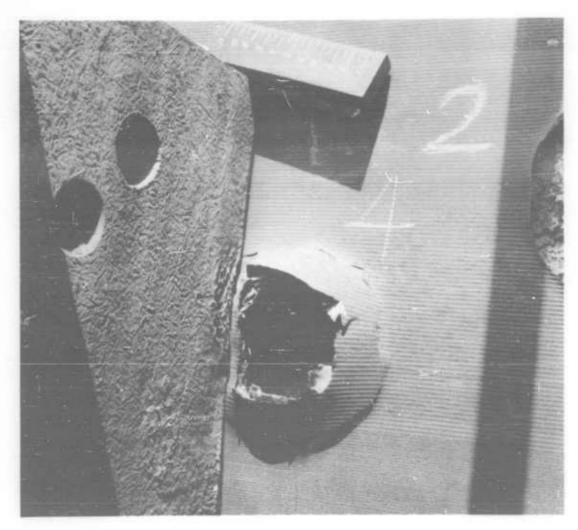


B22007: Front view of 8-inch plate fired at 1000 yards, zero degrees obliquity showing Round 4. Depth of hit - one inch.

C-32 CONFIDENTIAL



B22008: Front view of 8-inch plate fired at 1000 yards, zero degrees obliquity showing hit. This round was of low order due to fuze failure (T152E6).

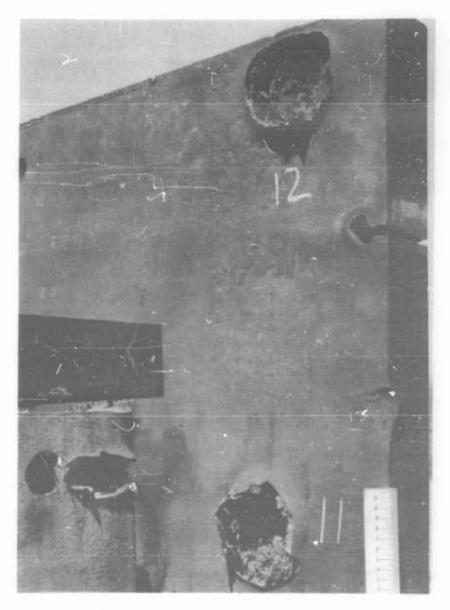


B22009: Rear view of 8-inch plate fired at 1000 yards, zero degrees obliquity, showing back spall from Round 4. T152E6. Depth of spall - 2 inches. Charpy value of plate - 62, BHN 241.

C-34
CONFIDENTIAL

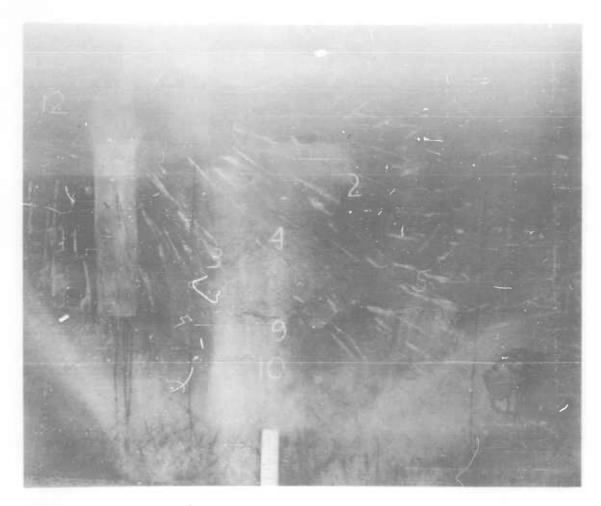


B22045: Front view of plate showing hits on 7-inch plate at 1000 yards with plate set at 0 degrees obliquity and splatter plate. The hole that is directly in front of the splatter plate was caused by Round 7 which fell short. The hit that bulged the splatter plate was caused by Round 8.



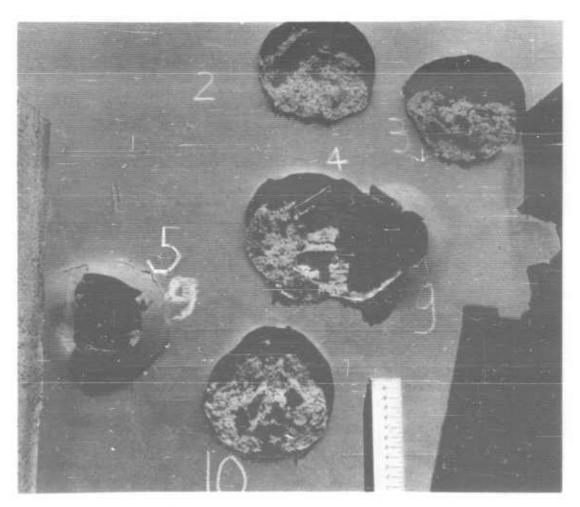
B22046: Rear view of 8-inch plate fired at 1000 yards at 0 degree obliquity showing back spalls of Round 11, T152E5 and Round 12, T152E6. The depth of the back spalls averaged 1-7/8 inches. Charpy value of the plate was 62, BHN 241.

c-36 CONFIDENTIAL



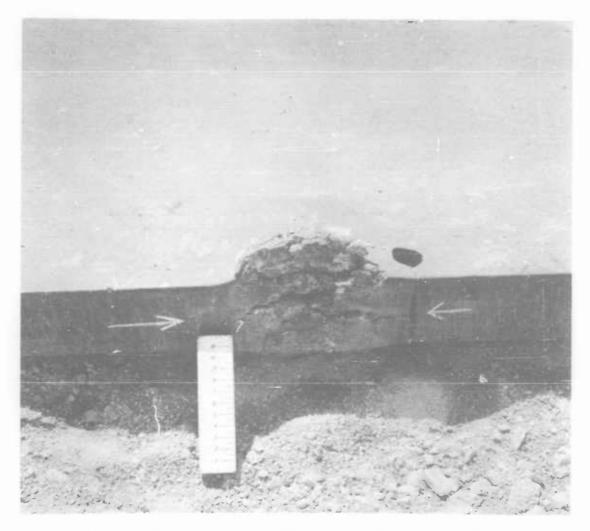
B22047: Front view of 8-inch plate fired at 1000 yards at 0 degrees obliquity showing hits on plate Rounds 1, 6, 7 and 8 missed the plate. Rounds 3, 5, 9 and 11, T152E5 and Rounds 2, 4, 10 and 12, T152E6.

C-37
CONFIDENTIAL



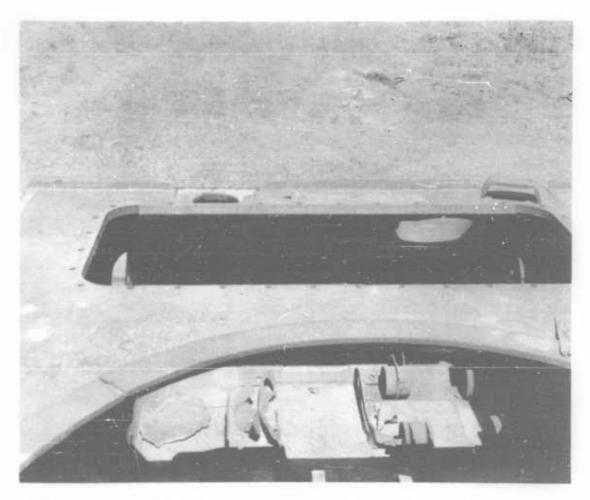
B22048: Rear view of 8-inch plate fired at 1000 yards at 0 degree obliquity showing back spalls from Rounds 2, 3, 4, 5, 9 and 10. Rounds 3, 5, and 9 were T152E5; Rounds 2, 4 and 10 were T152E6. Charpy value of the plate was 62, BHN 241.

C-38 CONFIDENTIAL



B22049: Hit on 5-inch splatter plate showing laminations. The petaling effect occurred on both sides of the plate. The depth of the cracks extend 7 inches in the center of the arrows. This was Round 8, T152E6.

C-39
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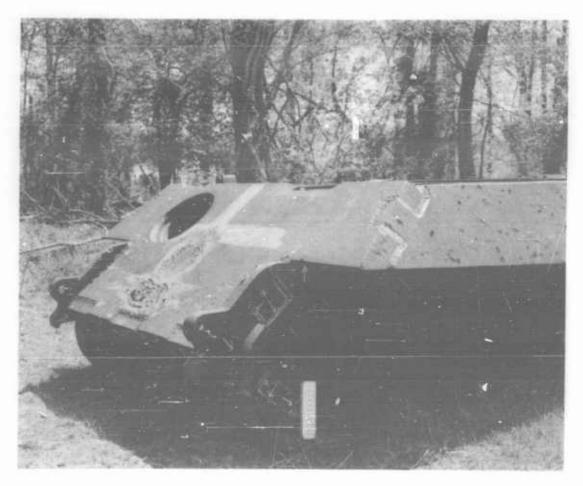
B24635: Interior of King Tiger Hull (German) fired at 1300 yards showing spall and back spall damage. Arrows indicate broken welds. Depth of back spall 2 inches.

C-40 CONFIDENTIAL



B24636: Front view of King Tiger Hull (German) fired at 1300 yards showing hit on frontal plate which was 44 degrees obliquity. Round 13, T152E5. Arrows indicate broken welds. Depth of hit was 1 1/4 inches.

C-41
CONFIDENTIAL

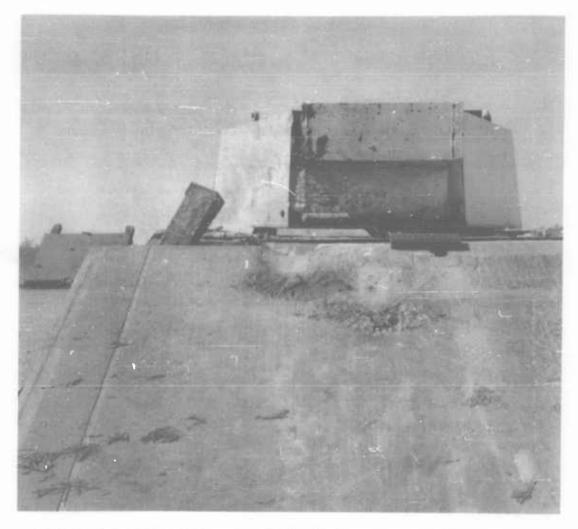


B24637: Side frontal view of King Tiger Hull (German) fired at 1300 yards showing extent of damage and depth of hit. Arrows indicate broken welds.

C-42
CONFIDENTIAL

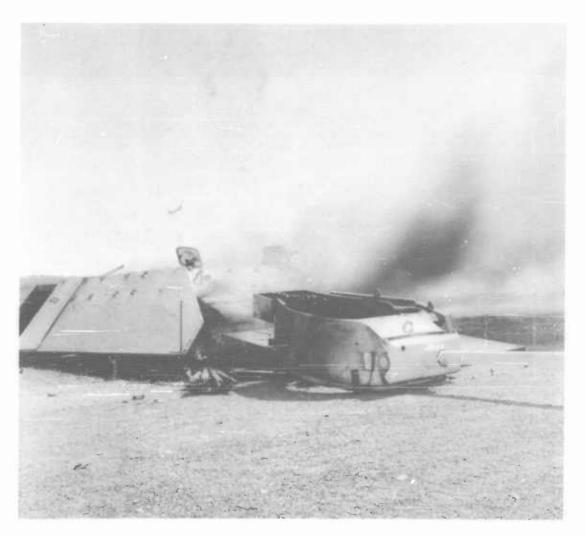


B24638: View of back spall of King Tiger Hull (German) fired at 1300 yards showing back spall. Depth of back spall, 2 inches.



B24755: Front view of 7-inch plate fired at 1000 yards at 60 obliquity, showing hits on plate. The top of the plate was supported by a M36, Gun Motor Carriage.

C-44 CONFIDENTIAL



B24756: Photograph of M36, Gun Motor Carriage, showing position of turret after hit by Shell, HEP, 155mm, T152E6, at base of turret ring. The top plates of the turret have been blown off. Range fired at: 1000 yards.

C-45



B24757: Side view of M36, Gun Motor Carriage, showing damage caused by hit of Shell, HEP, 155mm, T152E6, at base of turret. Range fired at: 1000 yards.

C-46 CONFIDENTIAL



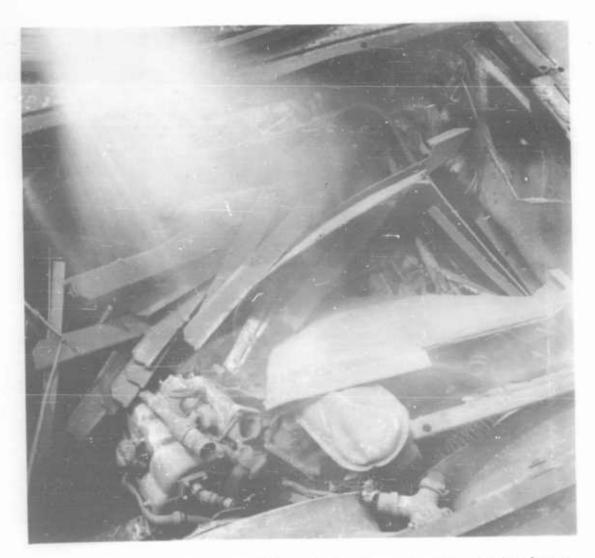
B24758: Interior view of turret, M36, Gun Motor Carriage, showing damage caused by one hit of Shell, HEP, 155mm, T15226.

C-47 CONFIDENTIAL



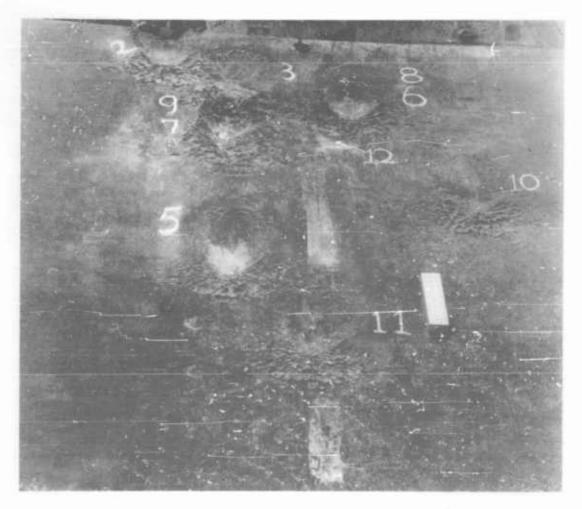
B24759: Rear view of Turret, M36 Gun Motor Carriage, showing damage. Arrow indicates point of hit by Shell, HEP, 155mm, T152E6.

C-48
CONFIDENTIAL



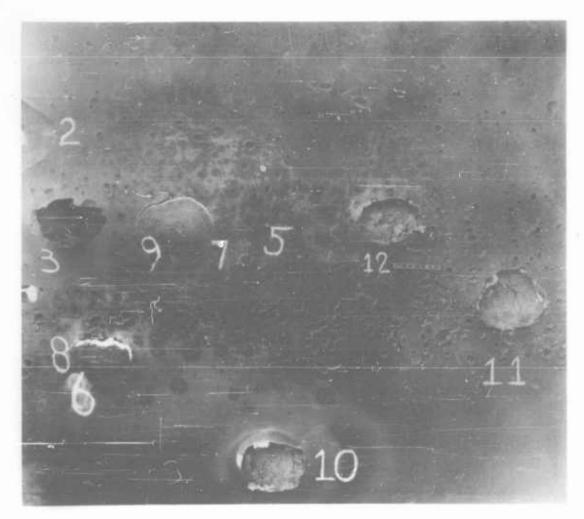
B24760: View of motor compartment, M36 Gun Motor Carriage, showing damage caused by Shell, HEP, 155mm, T152E6.

C-49 CONFIDENTIAL

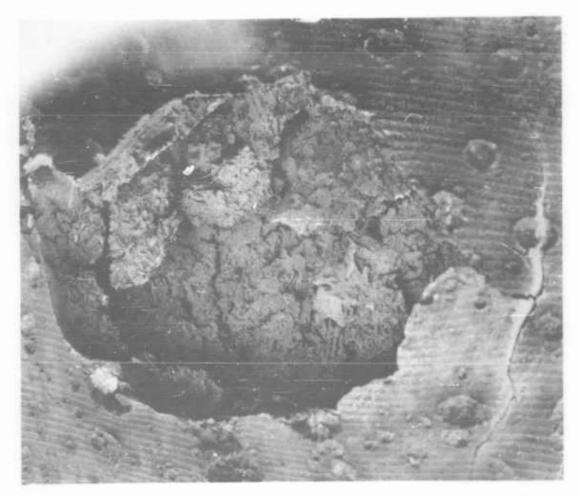


B25724: Front view of 7-inch plate fired at 1000 yards,  $60^{\circ}$  obliquity - showing ten hits on plate which had a charpy value of 103/91, BHN 235/232. Round Nos. 1 and 4 missed the plate. Round No. 8 was low order.

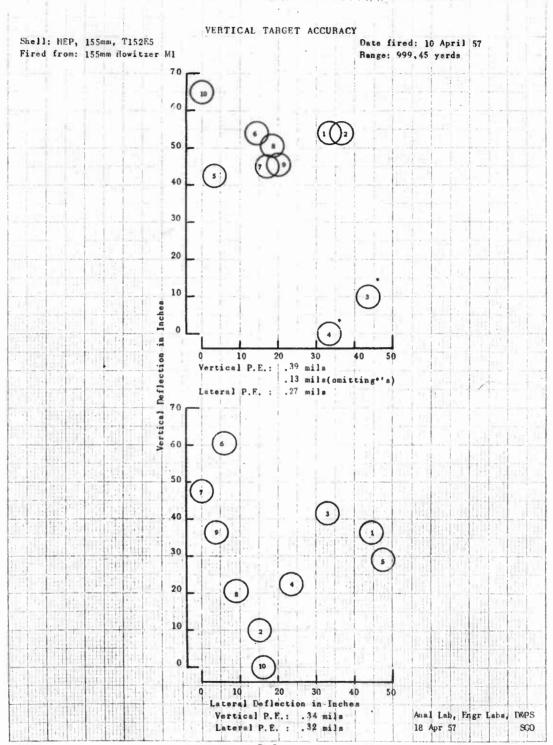
C-50 CONFIDENTIAL



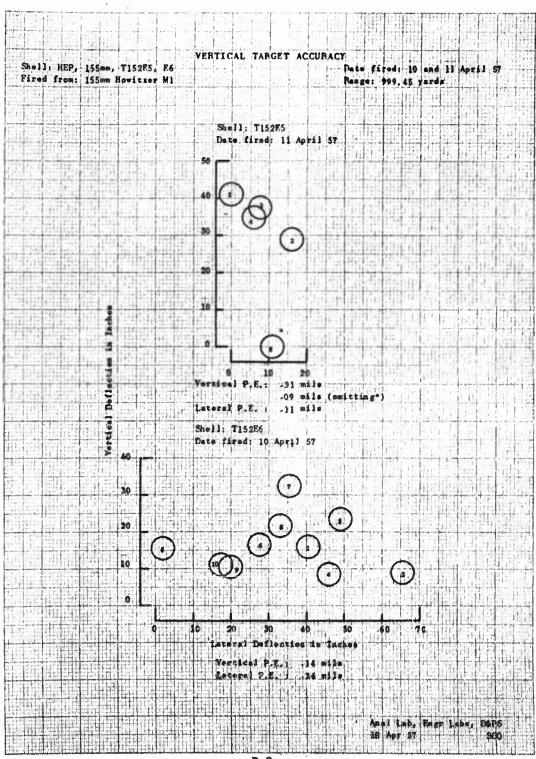
B25725: Rear view of 7-inch plate fired at 1000 yards,  $60^{\circ}$  obliquity - showing ten hits on plate which had a charpy value of 103/91, BHN 235/232.



B25726: Rear view of 7-inch plate fired at 1000 yards,  $60^{\circ}$  obliquity - showing back spall of Round 10, depth of spall is 3/4 inch size of spall is 15" x 12". Interior of spall is laminated.



D-1 CONFIDENTIAL



CONFIDENTIAL

#### ANALYTICAL LABORATORY REPORT

APPENDIX E

TEST OF:	Report No.	57-AI-46
Shell, HEP, 155mm, T152E5 and T152E6.	Date Submitted	21 May 1957
	Prepared for _	Mr. Ralph Allen,
OBJECT OF TEST:	Artillery Ammu	nition Branch
To obtain vertical target accuracy and exterior ballistic coefficients.	Dates of Test	10 and 11 April 1957
	Project No	TA1-5002H/TE20
	Work Order No.	32-236-54
	Sheet 1	of <u>1</u>

Target accuracy and time of flight firings were conducted with Shells, HEP, 155mm, T152E5 and T152E6 to determine form factor and ammunition dispersion on 10 and 11 April 1957, with a vertical target placed at 1000 yards from the muzzle of the gun. The results of the firings are contained in the following table:

	Avg Proj	Date	Ve	Velo	nstrument Velocity (fps)		aure /100)	Time of	of	٠,	Vertica	l Target
Shell	Wt.	Fired (Apr 57)	of Rds	Avg	Std	Avg	Std Dev	Flight (sec)	Bel Coef (G	Form Factor	P.E. (	
E5	70.55	· 10	10	1807	3. 1	286	3.7	1.78623	2.03	.89	.39 .13*	. 27
E5	70.52	10	10	18 12	3.5	290	7.2	1.78117	2.02	,90	.34	. 32
P6	77.83	10	10	1824	6.7	312	4.4	1.74858	2. 27	. 88	. 14	. 34
E5	70.62	11	5	-	-	292	3.6	-	-	-	.31	. 11

a. Omitting two maverick rounds.

b. Omitting one maverick round.

Prepared by W. E. Cartey

Reviewed by

Joseph E. Steedman Approved by

Technical Assistant Propellant & Target Accuracy A. E. Karp Chief Analytical Laboratory

Section

Engineering Laboratories Supporting Services Development and Proof Services Aberdeen Proving Ground, Maryland

E-1

ORDBG-677 Rev 25 Sept 52

# Ordnance Corps Aberdeen Proving Ground Maryland

	WINI	S ALOFT	
Balloon Run No.	Time of Release	Max. Ordinate Required (Ft.)	Max. Ordinate Reached (Ft.)
2 R	0934	15,000	15,000
3 R	1030	15,000	14,154
4 R	1157	15,000	15,000
5 R	1331	15,000	15,000
6 R	1430	15,000	15,000
	DENST	TES ALOFT	
Radio Metro Run No.	Time of Release	Max. Ordinate Required (Ft.)	Max. Ordinate Reached (Ft.)
2 R	0934	15,000	15,000
3 R	1030	15,000	14,604
5 R	1331	15,000	15,000
6 R	17130	15,000	15,000

ORDBG-569 Page Pages Rev. 25 May 46 Ordnance Corps Program Program 155mm Howitzer
Proof Off. Mr. Allen
Date 24 June 1957 ABERDEEN PROVING GROUND, MD. METEOROLOGICAL SERVICE Ascension No.: Time: 2 R 0934 Method Used: Az. Line of Fire: 39°00° GMD-1 WIND DATA ALOFT Time Observed Altitude m.p.h. m.p.h. yds. Mins. 0 0 - 7.7 -2.2 - 5.0 - 3.0 - 3.7 - 6.2 - 8.5 1 332 750 1148 +1.2 2 46.7 46.3 47.0 40.2 40.2 40.2 40.2 40.2 40.2 40.2 40.3 40.2 40.3 40.2 40.3 40.4 34 1514 5 1908 2304 - 8.5 -12.4 7 8 2719 3128 9 10 11 12 -104 13 14 15 16 17 18 -11.1 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 SURFACE DATA 235 (To) Wind Direction Temperature: of Scattered Clouds 77.8 Visibility: Pressure in Wind Velocity M.P.H. 7 miles 30.04 Relative Humidity Disappearance: Abandoned 81 8 Ballistic Density .977

ARMY - - Car --- ABERDIEN PROVING GROUND, MD

ORDBG-569 of Page Pages Rev. 25 May 46 Ordnance Corps Program 155mm Howitzer ABERDEEN PROVING GROUND, MD. Proof Off. Mr. Allen METEOROLOGICAL SERVICE Date 24 June 1957 Ascension No.: Time: 1030 24 June 1957 Az. Line of Fire: Method Used: 39°00° 155mm Howitzer WIND DATA ALOFT Time Observed Altitude  $\frac{x}{m.p.h.}$ m.p.h. yds. Mins. 0 - 7.3 - 4.2 +3.3 +3.2 0 1 392 746 - 4.0 +6.5 3 1077 - 6.6 +6.7 #5.1 #3.6 #0.6 1426 -10.8 5 1820 -11.8 2146 -11.5 78 -2.3.7 -4.7.2.2.8 -5.8 2532 2904 -13.3 -14.3 9 -16.0 10 -15.5 11 -12.6 12 -12.4 13 14 -12.8 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 SURFACE DATA Wind Direction (To) Sky: Temperature: Scattered Clouds 83.0 Visibility: Pressure in Wind Velocity M.P.H. 7 miles 30.05 69 % Disappearance failure Relative Humidity 8 Ballistic Density

968

ORDBG-569 of Page Pages Rev. 25 May 46 Ordnance Corps Program 155mm Howitter ABERDEEN PROVING GROUND, MD. Proof Off. Mr. Allen METEOROLOGICAL SERVICE Date 24 June 1957 Ascension No.: Time: 4 R 1157 Method Used: Az. Line of Fire: 39°001 GMD-1 WIND DATA ALOFT Time Observed Altitude m.p.h. m.p.h. Mins. yds. 0 0 - 2.9 + 4.0 1 365 M 2 719 M M 345678 1092 M M и м 0.6 M 2103 - 2.0 - 3.1 - 5.5 - 5.5 -12 1 9 3152 -12.8 10 3490 -15.1 11 3832 12 13 14 + 0.2 4880 -12.3 - 1.1 15 16 + 0.5 17 18 \* Instrument tracking failure precluded accurate observation at lower levels of sounding. 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 SURFACE DATA Sky: Scattered Clouds Wind Direction (To) Temperature: 85.0 165 Visibility: 5 miles Pressure in Wind Velocity M.P.H. 30.02 Disappearance: Abandoned 66 % Relative Humidity 5

Ballistic Density

.963

ORDBG-569 Page of Pages Rev. 25 May 46 Ordnance Corps Program 155mm Howitzer ABERDEEN PROVING GROUND, MD. Proof Off. Mr. Allen METEOROLOGICAL SERVICE 24 June 1957 Ascension No.: Time: 1331 5 R Az. Line of Fire: Method Used: 39°00° GMD-1 WIND DATA ALOFT Time Observed Altitude m.p.h. m.p.h. Mins. yds. Ó - 7.9 -13.3 +1.3 1 12.8 409 ヤ·6 ヤ・0 サラ・4 サラ・0 741 -12.5 3 1102 1445 5 1753 2079 -16.5 78 -1.6 -3.3 -2.9 2351 9 2982 10 3313 11 -2.1 12 -2.0 13 14 -1.7 4620 +0.1 15 16 +0.4 4973 - 9.7 -10.2 +0.6 5333 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 SURFACE DATA Sky: Temperature: Wind Direction (To) Scattered Clouds 87.0 210 Visibility: Pressure in Wind Velocity M.P.H. 5 miles 30.00 Disappearance: Abandoned Relative Humidity 60 8

Ballistic Density

.959

ARMY--- OE--- ABERDEEN PROVING GROUND, MD-- 506

ORDBG-569 Page Pages Rev. 25 May 46 Ordnance Corps Program ABERDEEN PROVING GROUND, MD: 155mm Howitzer Proof Off. Mr. Allen
Date 21 June 1957 METEOROLOGICAL SERVICE Ascension No.: Time: 6 R 1430 Az. Line of Fire: Method Used: 39°00° GO-i WIND DATA ALOFT W<sub>z</sub> m.p.h. Time Observed Altitude W  $\frac{x}{m \cdot p \cdot h}$ Mins. yds. 0 0 -10.0 -0.2 1 460 -16.1 #4.5 #6.4 2 828 -18.1 -19.5 -19.7 -16.8 3456 1238 1586 1954 2370 -14.8 7 8 9 10 -11.1 -10.1 -12.6 -1.1 -0.3 -14.8 11 -14.0 12.2 - 8.9 - 8.6 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 SURFACE DATA Sky: Temperature: Wind Direction (To) of Scattered Clouds 87 4. 220 Visibility: Pressure in Wind Velocity M.P.H. 5 miles 29.98 Relative Humidity % Disappearance: 63 10 Ballistic Density 957

ARMY---OE---ABERDEEN PROVING GROUND, MD-- 506

Program 155mm Howitze	Date 2	June 1957		
Proof Director Mr. A	Radio Meter	Radio Meteorograph Run Number 2 R Time Reached Altitude		
ime Released	Time Reach			
ALTITUDE YARDS	TEMPERATURE OF	RELATIVE DENSITY		
0	77 .8	•977		
190	71	.989		
383	69	•990		
579	69	•988		
779	68	•989		
983	68	•987		
1191	66	•990		
1402	63	•993		
1618	60	•998		
1836	58	•998		
2060	55	1,000		
2287	54	1.000		
2520	, <b>51</b>	1,001		
2757	Тig	1.006		
2999	45	1,008		
3219	hs	1.009		
3500	ЦO	1.009		
3159	39	1.008		
4025	37	1.006		

Program 155mm Howitzer			me 1957		
Proof Director Mr. Alle	n	Radio Meteorograph Run Number 2 R			
Time Released 0934		Time Reached Altitude 0917			
ALTITUDE YARDS	TEMPERAI	ATURE OF RELATIVE DENSIT			
4298	35		1.007		
4579	32		1,008		
4867	29		1,008		
5163	28		1.003		

Program 155mm Howitz	Date	Date 24 June 1957		
Proof Director	llen	Radio Meteorograph Run Number 3 R Time Reached Altitude 10:3		
Time Released	Time Re			
ALTITUDE YARDS	TEMPERATURE <sup>O</sup> F	RELATIVE DENSITY		
0	83.0	•968		
192	77	•979		
386	70	•991		
582	69	•991		
782	68	•989		
986	69	•987		
1194	67	•989		
1406	64	<b>.</b> 991		
1621	61	•995		
1840	57	1,001		
2063	56	1,000		
2291	54	1,001		
2523	52	1.001		
2760	L <sub>4</sub> 8	1,006		
3002	16	1.008		
3250	43	1.009		
3503	Į <sub>t</sub> o	1.010		
3761	37	1.012		
	=			
		2		

Program 155mm Howitzer		Date 24 June 1957  Radio Meteorograph Run Number 3 R  Time Reached Altitude 1043			
Proof Director Mr. Aller	Radio Mete				
Fime Released					
ALTITUDE YARDS	TEMPERATURE OF	RELATIVE DENSITY			
4027	38	1,006			
4300	35	1,007			
4580	32	1,008			
1,868	29	1,008			
-					
× .					
	. 2				
	,,				
8 °.					
		3			

Program 155mm Howitzer		일i June 1957		
Proof Director Mr. All	.eu.	Radio Meteorograph Run Number 5 I		
lime Neleased	Time Rea	ched Altitude		
ALTITUDE YARDS	TEMPERATURE OF	RELATIVE DENSITY		
0	87.0	•959		
194	82	•965		
391	79	.971		
591	77	•973		
794	74	.976		
1001	71	•981		
1210	69	<b>.</b> 983		
1424	67	•986		
1641	65	•986		
1863	63	.988		
2089	60	•992		
2319	· 57	•995		
2553	55	•997		
2792	51	1,001		
3037	цв	1,002		
3286	45	1,006		
354p	42	1,006		
3802	种	1,005		
	57 16			

Program 155im Hodtzer		Date 24 June 1957			
Proof Director	6 <b>17</b>	Radio Meteorograph Run Number 5 R			
Time Released 13	31	Time Reached Altitude 1347			
ALTITUDE YARDS	TEMPERAT	URE OF	RELATIVE DENSITY		
4070	39		1.004		
4345	36		1.006		
4627	36		1.001		
4918	33		1.002		
5217	30		1.003		
-					
		: ::			
			•		

# Development & Proof Services Aberdeen Proving Ground, Md.

# TEMPERATURES AND DENSITIES ALOFT

Program 155mm Howitze		24 June 1957			
Proof Director Mr. Al	lon Redio Me	Radio Meteorograph Run Number 6 R Time Reached Altitude			
Time Released 11,30	Time Rea				
ALTITUDE YARDS	TEMPERATURE OF	RELATIVE DENSITY			
0	67 J.	•957			
194	80	•969			
391	80	•970			
591	77	•972			
794	74	•976			
1000	72	<b>.</b> 980			
1210	70	•981			
1424	67	•985			
1641	61+	<b>.9</b> 88			
1862	61	•992			
2087	58	•995			
2317	55	•998			
2550	53	•999			
2790	51	•999			
3034	49	1,001			
3284	46	1,001			
3540	46	•999			
3802	Le	1,002			
4071	抑	1,001			
4347	38	1.003			
4630	36	1,002			

# Development & Proof Services Aberdeen Proving Ground, Md.

## TEMPERATURES AND DENSITIES ALOFT

Program 155mm Howitzer		Date 24 June 1957			
Proof Director	Radio Me	Radio Meteorograph Run Number 6 R			
Time Released	Time Rea	ched Altitude			
ALTITUDE YARDS	TEMPERATURE OF	RELATIVE DENSITY			
4921	33	1,001			
5220	29	1.003			
9220					
¥7					
=	-	,			
		1			

ARMY--OS---ABERDEEN PROVING GROUND, MD 542

# ENGINEERING LABORATORIES PHYSICAL TEST LABORATORY REPORT

ORDBG-DP-LP	
TITE:	Report No. 57-P-45
Metallurgical and Chemical Analysis of Armor	Sheet 1 of 3
from German Royal Tiger Tank Hull.	Date of Test 1.8 June - 26 July 1957
OBJECT OF TEST:	Report Completed 7 August 1957  Conducted for Mr. R. Allen,
To determine physical properties, metallurgical	Artillery Division
structure, and chemical composition of the 6" armor.	Project No. TA1-5002H/TE20
INTRODUCTION:	References Military Specification
The project engineer requested that these tests	MIL-A-12560 (Ord)
be conducted on a section of hull German Royal Tiger tank hull. The	armor from the upper front plate of a ese hulls were shipped to APG from the near the end of World War II. They have
been used in various tests where a quality was required. A test has performance of a round is being ev	hermor was desired, but no particular been conducted recently, however, in which valuated, and the question arose as to all. Since no data on this armor was
	chemical analyses were requested.

#### TEST PROCEDURE:

- 1. A section approximately 15" square was flame cut from the upper front plate. Cross-sectional plates were sawed from this section, at right angles to each other, for a macroetch test to determine the major direction of rolling. These were designated "X" and "Y" and were selected at least 4" from any flame-cut surface. The plates were given a hot acid macroetch in 50% HCl.
- 2. Three standard Charpy "V" Notch Specimens and one standard 0.505" diameter tensile bar were machined from each of the above plates and designated as "X" and "Y", according to the plate from which machined (see photographs, Appendix II for location of test specimens). Tensile and Charpy impact data were obtained. Brinell hardness readings were taken through the cross-section of each plate.
- 3. Specimens were mounted in bakelite, polished, etched and examined under high magnification. Photomicrographs are included in Appendix II.

Report No. 57-P-45 Sheet 2 of 3

4. Drillings were obtained through the cross-section of the armor and sent to the Coating and Chemical Laboratory for the chemical analysis.

#### RESULTS:

- 1. The macroetched plates showed the armor to be free of large laminations, seams, cracks, porosity, or other serious macro-defects. The plate appeared to be cross-rolled but the major direction of rolling could not be determined, since both directions had about the same appearance. The relatively intact dendritic structure indicates that working was not severe (see photographs, Appendix II).
  - 2. Mechanical test data follows:

#### a. Charpy "V" Notch Impact Data

Spec. No.	Breaking Temp, *F	Energy Absorbed ft-lbs	Fracture Appearance*
Yl	70	35.0	40s, 60c
XI.	70	35.0 28.5	30S, 70C
Y2	-40	7.0	100C
X2	-40	5.0	100C
Y3	200	42.0	50S, 50C
X2 Y3 X3	200	43.0	50S, 50C

<sup>\* &</sup>quot;S" denotes shear; "C" denotes cleavage type of fracture.

#### b. Tensile Test Data (See Appendix I for Stress-Strain Curves)

Spec. No.	Yield Strength (.1% offset, psi)	Tensile Strength psi	% Elong. in 2"	% Reduction in Area
X	89,500 89,000	118,250	19.5	53.7 56.3

#### c. BHN, 3000 Kg

Spec. No.	No. Readings	Range	Average
X	. 6	235-255	248
Y	6	241-255	244

3. Viewing the microsample in the unetched condition revealed this armor to be clean and largely free from non-metallic inclusions. A few scattered, elongated inclusions were noted, probably of MnS. The etched samples showed the microstructure to be fairly coarse tempered martensite. Some

Report No. 57-P-45 Sheet 3 of 3

ferrite was present and fairly noticeable banding was present. (See photomicrographs, Appendix II).

4. Results of the Chemical Analysis follow:

Carbon	0.43%
Manganese	0.43
Silicon	0.33
Sulfur	0.019
Phosphorus	0.024
Nickel	0.14
Chromium	2.17
Molybdenum	0.22
Vanadium	0.01

#### DISCUSSION:

- 1. A comparison of the results of this analysis against the requirements of the current U.S. Military Specification for wrought armor leads to the following observations:
  - a. The armor tested is within the specification for hardness.
  - b. Carbon content is higher than the specified maximum.
- c. Charpy impact values are far below those required for armor plate of this thickness and hardness.
- 2. Since the steel is clean, sound, and has enough alloy content to be in the armor class, it appears that the poor impact resistance largely results from the heat treatment. The presence of some high temperature transformation products, coarse structure, and fairly high carbon content contribute to the poor impact values.

#### CONCLUSION:

The plate investigated should be considered poor quality armor.

2 Incls.
Appendix I
Appendix II

Approved M. M. Kinley

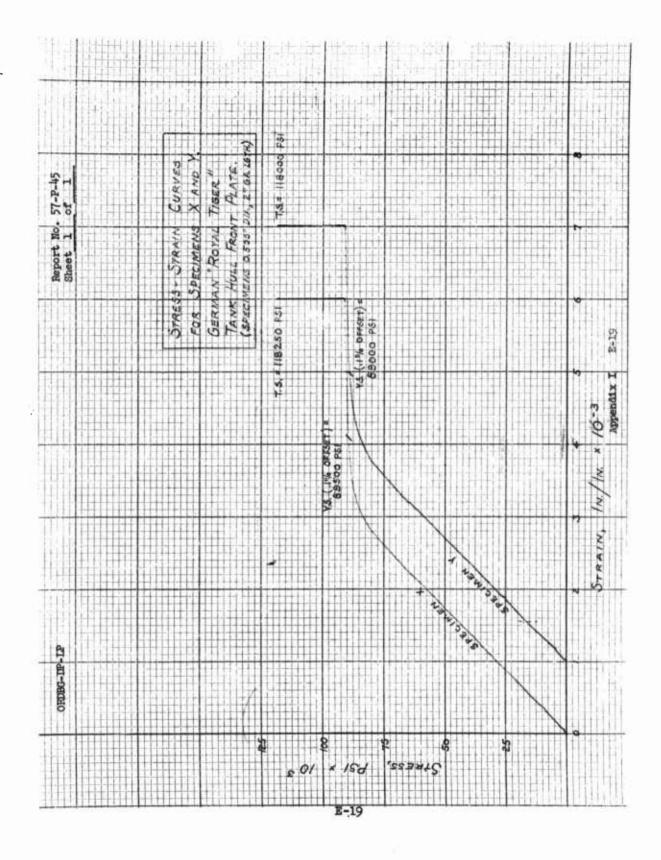
Physical Test Laboratory

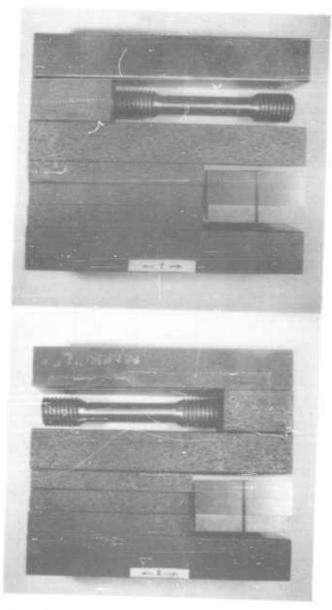
signed: R & Huddle to

R. L. Huddleston

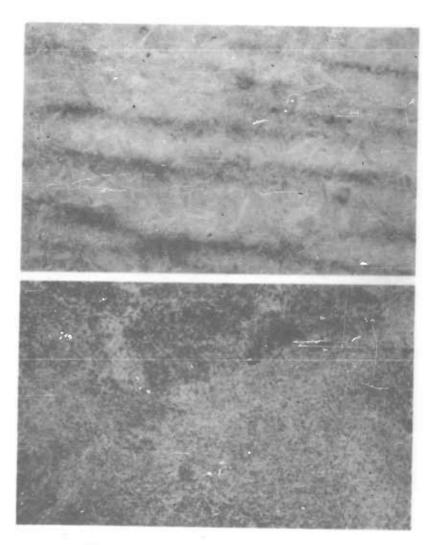
Chief

Rad. & Met. Section





Approx. 2X. Macroetched "X" and "Y" crosssections showing location of test specimens. "X" and "Y" sections were selected normal to each other.



Top: 250X (Picral Etch). Microstructure showing tempered structure, banding, and scattered inclusions.

Bottom: 750X (Picral Etch). Tempered martensitic structure.

Appendix II

	ONDBO	G-859k	(Re	inst 22 Ma	r 55)		155 mas	Howitzer T	ube, Ml			
							Main Bore	- 29.70"	to 142.80"			
- 1		1		Dist	nce	(Inches)	From	Gaure Meas	indicated	in 1/1000 of an inch		
	1	1		Rear I	nce	Muzzle	Rear Face	6 JOOM LAND	S ic Diameter	6 200 GROO	VES sic Diamete	
		1		of Bre		Face	of Tube	Vert.	Hor.	Vert.	Hor.	
~	- 1	1/		Howitz		Tube	Tube	Vert.	HOF.	Vert.	HOF	
NUMBER	1	V		DOWLLY		Tube	Tune					
		Y		149.	10	.10	142.70	4.000	4.003	4.003	4.003	
CASIING		Λ		148		1.20	141,60	.)	2		3	
2		$\Lambda$		147		2.20	140.60	2	2	21	3	
3	İ	11	40	145		4.20	138.60 133.60	)	2	4	3	
1		/ \	(10	140		9.20	133.60	٠	2	1:	3.	
-		/ \	603	135		14.20 19.20	128.60 123.60	.,	2	1.	3	
+			7			24.20	118.60	2	3	)].	1,	
			3	120		29.20	113.60	2	3	4	4	
			Į.	1775		34.20	108,60	9	3	24	14.	
			Ç	110		39.20	103.60			1	11.	
2			3	105		44,20	98.60	,		5	2 <sub>F</sub>	
5			-	100		40.20	93.60		11.	5	1	
2		10		95		54.20	88,60	100	1,	5	ls.	
MANUF ACTURER		ARS	PROOF OFFICER	90		59.20	83.60	(10)	1, -	5	7,	
¥			1	85		64.20	78.60	- 13	5	5	11-	
		THA! M	0 7			69.20	73.50	3 *	5	5	14.	
		-	30F	75		74.20	68.60	0	5	5	}	
			PRO	70		79.20	63.60	23, .	-5		16	
-				65		84.20	58.60		5		15	
				60	40	89,20	53.60				1	
				50	40	94.80	48.00 43.60		- 2		1	
				48	70	100.90	111 00	1			1,	
- [			3	46.	30	103.20	41.90 39.60	``			1	
	ŀ		140	44		105.20	37.60			5	1,	
MODEL			=	42	20	107.00	35.80		v	5		
ş		B	9	40		109.20	33.60		1/2	1.7		
		1221	ž.		10	110.10	32.70		i i	7		
			2 OF		10	111,10	31.70	11		743		
			NUMBER		10	112.10	30.70	1	1.2	- 9	Ĩ	
	1		₹	36.	50	112.70	30.10					
+				36.	20	113.00	29.80		7000	*	f	
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NUMBER			4					22.1	121:"	190"		
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	e	in Howitzer										
	155 Howitzer Tube	Wil										
	H.	Ho	SN NC									
	22	5	DATE OF GAUGING									
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	2	111	W									
	5	101	DAT	4								
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Part 2	OK (Reinst	22 Mar 33)	155 m	Hou	vitzer Tu	be, Ml		0.00#	CHAMBER to 28.70	" (BASIC)
DISTAN	E (Inches	) FRON			GAUGE MEAS		NDI CATED IN	1/1000 OF	AN INCH	12114141
AR FACE BREECH	MUZZLE FACE	REAR FACE OF TUBE	BASIC DIAMETER	ZERO	GAUGE READING	ACTUAL DIAMETER	DIFFERENCE	GAUGE	ACTUAL DIAMETER	DIFFERENCE
35	114,20	28.60	6,2103		088	6.212	4.002	088	6.212	1.002
34	115.20	27.60	6.3107		4 6	.306	- 5	1 6	.305	- 5
33	116,20	26.60	6.4110	=	105	.405	6	105	405	6
32	117.20	25,60	6.5113	300"	207	.507	łį.	207	507	25
31	118.20	24.60	6,6117	9	306	.606	6	306	606	6
30.50	118.70	24.10	6.6618		356	656	6	355	656	6
30.10	119.10	23.70	6,693		- <b>/1</b> 92	6.692	001	4.192	6.692	001
28	121,20	21,60	6.693		195	.695	1 2	195	695	7 2
26	123,20	19.60	6.693		195	695	2	1.95	695	2
24	125.20	17.60	6.693		195	695	2	1.95	695	2
22	127.20	15,60	6,693		196	695	3	-196	696	3
20	129,20	13.60	6,693		196	696	3	196	695	3
18	131.20	11.60	6,693		195	696	3	196	696	3
16	133,20	9.60	6.693		196	696	3	196	696	3
14	135.20	7.60	6.693	ō	196	696	2	196	696	3
12	137.20	5,60	6.693	500		696	3		695	3
			6,693	9	196			196		
10	139,20	3.60			196 196	696 696	3	196 196	696 696	3
8	141.20	2.60	6.693		196	696	3	196	696	3
	1111		0.071							
			7				Basic	Ac tual		
Openi	e betwe	en bree	eh		11 0'01		#000 #	000		
		face o			3 0 01	ock	,000 H	000		
					7 0'01	ock	.000 M	000		
				1						
17			\							
		1								
,		<u> </u>								
					SPECIAL HE	SUREHENTS	1	1		
TOTAL LE	HSTH OF ME	mHow1tz	ex 149.2		ACTUAL COL	ROTATION	OF TUBE AT E	REECH	BASIC	ACTUAL
	NGTH OF TU			+	149.20"	MOVEMENT	OF TUBE AT B	REECH		~~
DEPTH OF	BREECH RE	CESS	6.1	HOH	6.40"	NUMBER OF	LANDS AND G	ROOVES	14g	148
Adyan	ce of Ri	fling		00"						-,-0
Inspec	tion Re	marksi	Areas f	rom	O" to 1	04 .104	to 1.399	" (23.7	9" to 28	70")
and fr	om 28.7	O" to 29	.70" we	re n	ot measu	red. He	at checki	ng encir	cling of	win
and es	tending	forward	(appro	x) 1	0.00".	Driving	and non d	riving e	dges of	lands
enciro	ling or	igin lie	htly ro	unde	d.					-
		U'					969	,		
							7 - 1			
								VIEWED BY		
								TIEMEN RY		
Prev	APG PA	PED			AUGED AND II	NOTEGIED DI	N.E.	TICHED OF		
RODMAN	APG PA	PED				NOFECTED BY		MPILATOR		
RODMAN	APG PA	PEO		RC	ope	NSFECTED BY	COI			

CASTING NUMBER		1		I	Distance		Main Bore	- 29.701	to 142,80"				
CASTING NUMBER		\ /		L	Donner			The state of the s		1 19 6 4 0			
CASTING NUMBER		\ /					From	Gauge Meas	indicated S Diameter	in 1/1000	ves sic Diamet		
CASTING NUMBER				F	lear Face	Muzzle	Rear Face	6.100" Bas	Ic Diameter	6.200 Be	sic Diamet		
CASTING NUMBER		11/			f Breech	Face	of Tube	Vert.	Hor	Vert.	Hor.		
CASTING NUM		M			lowitzer	Tube	Tube						
CASTING	- 1	V		-				,			, , , , , , , , , , , , , , , , , , , ,		
CASTIN		I		-	149.10	.10	142,70	₹.005	4.003	7.003	F.003		
CASI		Λ		- 1	148	1.20	141.60	3'	. 5	3	3		
3				Ļ	147	2.20	140.60	3	2	<u> </u>	3		
		$I \setminus V$		H	145	4.20	138.60	3	2	3	3		
	- 1			L	140	9.20	133.60	3	2	3	3		
- 1	V	1		-	135	14.20	128.60	3	2	3	3		
				ŀ	130	19.20	123.60	3	2	3	3		
				ļ	125	24.20	118.60	- 2	2	3	3		
				-	120	29.20	113.60	2	2	.3.	3_		
				-	115	34,20	108.60	2	3	33	3		
	i			15	110	39.20	103.60	2	, 3	3	3		
				3	105	94,20	98.60	2	3	3	3		
2				07	100	49.20	93.60	2	3	3	3		
E E			~	2	95	54,20	88.60	3	l <sub>L</sub>	3	1,		
MANUFACTURER	1	S	PROOF OFFICER	엙	90	59.20	83.60	3	1 <sub>k</sub>	3	1		
¥		AES	Į.		85	64.20	78.60	3	λ,	3	14-		
		F	0	0	80	69.20	73.60	3	5	3	1,		
	- 1	$\geq$	9	-	75	74.20	68.60	l <sub>L</sub>	5	14	11		
		g.m.re	8		70	79.20	63,60	5	5	1,	5		
+				4	65	84.20	58.60	5	5	lμ	. 5		
				ŀ	60	89.20	53.60	5	5	<u> </u>	5		
				-	54, 40	94.80	48.00	5		)լ.	5		
				-	50	99.20	43.60	5	5	11.	5 5		
				H	48.30	100.90	41.90	5		չբ			
			١,	10:	46.	103.20	39.60	5	6	5	- 5		
اید			S.	-4	71,71	105.20	37.60	5	6	5	5		
HODEL			ROUNDS	- 1	42.20	107.00	35.80	5	6				
X .				-	-		140	109.20	33.60	5	7	5	5
			9					39.10	110.10	32.70	6	7	6
			œ	H	38.10	111.10	31.70		9	7	7		
			NUMBER	ŀ	37.10	112.10	30.70 30.10	12	12	7	8		
			3	ŀ	36.50	113.00	29.80	18:	4.025	/ 000	8		
十	-			+	36.20	113.00	29.80	£.025	F.025	<b>≠.</b> 009	<b>7.009</b>		
				- 1				1					
	tube		Que	-				Pullover	Meas.				
	3			<u>∗</u> [					Vert	Horz			
	100		Check	K.				29.80	6.125"	6.125"			
2	- 1		S	1									
NUMBER	Buiding		2	4									
≡[	6	7	E	ŀ					ļ				
	8		5						-				
-	No st		FIRTNG	BEFOR									
-	0							<del> </del>					
	75		-	+			-		_		-		
_		Fe	-	+				<b>———</b>	<del>                                     </del>				
		27		ļ	17								
	155 Howitzer Tube	Mounted in Howitzer		t									
	EH	0											
	er	国	S	H									
	43	ä	DATE OF GAUGING	22 IBY 1957			ļ						
	Y.	rd	S						<b>_</b>				
	R	4	OF	d									
	m	n	Ш	4			-	-	-				
	5	9	DA	S				1	<u> </u>		L		

Part 2	9K (Reinst		155 au	но но	witzer Tu		NDI CATED IN	0.00#		" (BASIC)
AR FACE	MUZZLE				CARREL ACA.	VERTICAL	Y		HORIZONTAL	X
BREECH	FACE	REAR FACE OF TUBE	BASIC DIAMETER	ZERO	GAUGE READING	ACTUAL DI AMETER	DIFFERENCE	GAUGE READING	ACTUAL DIAMETER	DIFFERENCE
35	114,20	28.60	6.2103		007	5.213	7.003	087	6.213	4.003
34	115,20	27.60	6.3107		4.000	.309	002	1.009	.309	002
3	116,20	26.60	6.4110		110	111.0	.001	.3.3.0	.l:10	.001
32	117.20	25,60	6,5113		212	513	1.002	.212	.513	7.002
31	118,20	24.60	6.6117	j	312	6.13	.000	.312	.612	.000
0.50	118.70	24.10	6.6618		4.362	662	.000	1.362	.662	.000
0.10	119.10	23.70	6,693	300"	4.393	6.693	.000	4.393	6.693	.000
28	121,20	21,60	6,693	30	396	.696	4,003	396	.696	7.003
26	123,20	19.60	6.693	10	395	695	.002	. 395	.695	.002
14	125.20	17.60	6.693	1	395	.695	.002	396	.696	.003
2	127.20	15.60	6.693	1	396	.696	.003	396	. 696	.003
20	129,20	13,60	6.693		396	696	003	396	.606	.003
8	131,20	11,60	6,693		395	606	.003	396	.696	.003
6	133,20	9.60	6.693		396	.696	.003	396	696	.003
4	135.20	7.60	6.693		397	697	.004	397	.697	:004:
12	137.20	5,60	6,693		397	597	(7)4	397	,697	.004
LO	139.20	3,60	6.693		397	.597	.004	.397	.697	.004
9	140.20	2,60	6,693	1	397	.697	.004	.397	.697	. CO4
g	141.20	1,60	6.693		4.397	.697	.004	4.397	.697	.001
							Basic	Actual		
Openia	g betwe	en bree	ch		11 0'01	o ck	.000"	*000 H		
		face o		]	3 0'01	ock	*000 H	.000"		
					7 0'01	ock	,000 H	.000 II		
										1
					40000000000	* * 11 - 12 - 12 - 12 - 12 - 12 - 12 - 1				
		-	BASIC		SPECIAL HE	SUKEMEN 13			BASIC	ACTUAL
TOTAL LE	GTH OF SER	mHow1tz			149.20"	ROTATION	OF TUBE AT	REECH		
TOTAL LE	GTH OF TU	BE				HOVENENT	OF TUBE AT	REECH		PM 200
DEPTH OF	BREECH RE	CESS	6.1	101	6.40"	NUMBER OF	LANDS AND	ROOVES	jtg	48
Adyand	e of Ri	fling	-	100						
			-4		O# to .1	01 101	to 1.399	H (23.7	9" to 28	70#1
							escoped:			
and IT	ohenha	n Wood	cheolei	ne i	and menta	or Owleds	and exte	anding fo	mand /	anarrow)
18.001							encircli			
rounde	d. Len	ds light	tly copm	ere	i with li	ght plts	in groo	res throu	whout m	uzzle
half c	of bore.									
							95%			
	STAM	PED		TAPC	AUGED AND II	SPECTED BY	PE	IEWED BY		
	ATD/T TO	٨	,		DDG	COLED OF				
	William I			TIME			1 (0)	4PILATOR		1
Prey) RODMAN Ct	mningha Gurlen			TIME	525			APHED BY		

_	ORDE	G-859k	(E	Cein	st 22 Mar 55)		155 mm	Howitzer	Tube, Ml												
		1			Main Bore - 29.70" to 142.80"  Distance (Inches) From Gauge Mess indicated in 1/1000 of an Rear Face Muzzle Rear Face 6.100" Basic Diameter 6.200" Basic D																
-		1 /			Distance	(Inches)	From	Gauge Nea	ne indicated	1n // 100	Over an in										
-		N I		- 1	Rear Face	Muzzle	Rear Face	6.100" 80	DS sic Diameter	6.200	esic Diame										
1		$\Pi I$			f Breech	Face	of Tube	Vert.	Hor.	Vert.	Hor.										
MUSTOLIN		11/			lowitzer	Tube	Tube														
	134	٧.			- 110		100	,	/ 6110	1 6- m	1 005										
			Ì		149.10	.10	142.70	4.001	1.002	7.005	7.005										
		A		- 1	148	1.20	141.60	1.	2	5	5										
		11			147	2,20	140.60	1	J.	5	5										
ı		11		- [	145	4.20	138.60	1	1	5	5										
l		1/ \		ı	140	9.20	133.60	1	1	5	5										
ı		1		- 1	135	14.20	128.60	1 7	1 1	5	5										
I		1		ŀ	135				-		15										
+				- 1	130 125	19.20	123.60	1		5	The state of the s										
İ				- 1	125	24.20	118.60	1	1		5										
l				- }	120	29.20	113.60			5	5										
1				15	115	34.20	108.60	1	1	5	5										
ļ				5	110	39.20	103.60	1	1	5	5										
			1	5	105	44.20	98,60	1	1	5	5										
I				23	100	49.20	93.60	1	1	5	5										
I	8				95	54.20	88.60	7	3.	5	- 5										
I			85	332	90	59.20	83.60	1	1	5	5										
-	5		OFFICER	00	85 85	64,20	78.60	-	1	5	5										
-			3	5																	
ŀ	of .		0		80	69.20	73.60	1	1	5	55										
Yuba	12	2.	PROOF		75	74.20	68.60	1	1	5	5										
	in !		20	part .	70	79.20	63.60	1	1	5	5										
					65	84,20	58,60	1		5	5										
				- 1	60	89.20	53.60	)	1	5	1 5										
				- [	54,40	94.80	48.00	1.	3.	5	5										
١					50	99.20	43.60	9	1	5	ι,										
1				1	48.30	100.90	41.90	2	2	5	5										
ı				1	46.	103.20	39.60	2	0	5	- 5										
l					777		37.60	3		65	5										
ł			S	ı		105.20			2		5										
			OF ROUNDS	01	42.20	107.00	35.80		2	5											
L	,		2	ζŭ	40	109.20	33.60		3	5	5										
Ī	G		14	3	3	2	긔			2	2	3	ğ	1222	39.10	110.10	32.70	14	3	5	5
ı			NUMBER 0	ı	38.10	111.10	31.70	5	3	- 6	5										
I				- I	37.10	112,10	30.70	6	5	1	5										
I			3		36.50	112.70	30.10	- 51	6	[3	6										
l			2	ľ	36,20	113.00	29.80	4,012	4.009	401.0	4003										
Ť			Т																		
۱			5																		
١		- 3	(aug																		
I			5	AFTER					1												
1			Check	5																	
			14																		
1			2																		
1	~		STATUS																		
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	ส		9	BEFORE																	
١			FIRING	5		41															
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l			П																		
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	De	42									_										
	Z	V.							-		-										
	84	Ho	45				-	<del> </del>	+												
	155 Howitzer Tube	Mounted in Howitzer	DATE OF GAUGING	July 1957							+										
	43		AUC	H				9													
	NO.	P	I G	12-																	
	H	nt	0	2					1												
	5	\$	E						1												
		. =	10	-																	

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155m/m Now Tube

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Part 2	OK (Reinst		155 m	Ho	witzer Tu			0.00#		" (BASIC)
	E (Inches				GAUGE MEA	SUREMENTS II	DICATED IN	1/1000 OF		+
AR FACE BREECH	FACE	REAR FACE OF TUBE	BASIC DIAMETER	ZERO	GAUGE READING	ACTUAL DI AWETER	DIFFERENCE	GAUGE READING	ACTUAL DIAMETER	DIFFERENCE
35	114,20	28.60	6.2103		<b>-</b> 057	6.213	4.003	007	6.21.3	1.003
34	115.20	27.60	6.3107		f.013.	5.311	.000	7.011	6.311	.000
33	116.20	26.60	6,4110		.112	6.41.2	4.001	.11.2	6.412	4.001
32	117.20	25,60	6.5113		.211	6.511	.000	.211	6.511	.000
31	118,20	24.60	6.6117		. 31.5	6.61.5	4.03	.31.5	6.615	7.003
	118.70	24.10	6.6618		4.367	6.667	<b>∤.</b> 005	.367	6.657	7.005
30.10	119.10	23.70	6.693		<b>4.</b> 303	6.593	.04.0	4.393	6.693	,000
	121,20	21.60	6,693		, 395	6.695	1.012	395	6,695	4.002
26	123,20	19.60	6.693		2015	6.695	.003	396	6.696	003
24	125.20	17.60	6.693		.396	6,696	.003	.396	6.698	.003
55	127,20	15.60	6.693		-395	6.590	.003	396	6.000	.003
20	129,20	13.60	6.693		205	6.595	.003	306	6.606	.003
18	131,20	11.60	6,693	=	306	6.000	.003	306	6,695	.003
16	133.20	9.60	6.693	3	396	9	.7.13	395	5.605	.003
14	135,20	7.60	6.693	ര	306	6.695	(4)3	396	6,606	.003
12	137,20	5,60	6.693	ဖ	396	5.695	.003	396	6.696	.003
10	139.20	3.60	6.693	1	395	6.696	.003	396	5.696	.003
9	140,20	2.60	6.693		. 596	0.000	.003	. 390	(5,0)0	.003
g	141.20	1,60	6.693	-	4.396	6.696	.003	F-395	6,695	7.003
							Basic	Actual		
		en bree		1	11 0 01		.000 n	,000		
ring	and rear	face o	tube	1	3 0 01	-	,000#	(300	-	
				1	7 0'0	lo cik	.000 H	.000		
				1		Dist	Fullove	r Leas.		
				Į		d'recen				
						R. 75.	Vert	Horz		
						2980	6.111"	6.111"		
			BASIC		ACTUAL	ASUREMENTS			BASIC	ACTUAL
TOTAL LE	NETH OF THE	ncHowitz	er 149.2	20"		ROTATION	OF TUBE AT 6	REECH		
TOTAL LE	NGTH OF TU	96				MOVEMENT	OF TUBE AT I	REECH		
DEPTH OF BREECH RECESS 6.40%					6.40"	NUMBER OF	LANDS AND	ROOVES	j†8	48
		IIIne		100						
	ce of Ri									
Advance (Plu	tion Re	marks:	Areas f	rom	O" to .1	0", 10"	to 1.399	1, (23.7	9" to 28	70")
Advance (Plus Inspectant fr	tion Remon 28.7	marks:	Areas f	rom re n	ot measu	red. Lig	ht rust	nits and	staning	en-
Advance (Plumane Inspectant from and from circlin	om 28.70	marks: O" to 29 er chamb	Areas f	rom re n	te to li	red. Ligght heat	ht rust checking	pits and beginni	stanins ng (appr	en-
Advance (Plumane Inspectant from and from circlin	om 28.70	marks: O" to 29 er chamb	Areas f	rom re n	te to li	red. Ligght heat	ht rust	pits and beginni	stanins ng (appr	en-
Inspectant from the circlin 12.00"	tion Reson 28.70 ng powde from re	marks: O" to 20 er chamb ear face	Areas f 3.70" we er. Mod of tube	rom re n lera	ot measu te to lin chamber	red. Lig ght heat and exte	ht rust checking ending fo	pits and beginning rward to	stanins ng (appr (approx	en- ox) 12.00"
Advance (Pluse and free circlin 12.00" forward	tion Reson 28.70 ng powder from real of ord	marks: O" to 29 er chamb ear face gin of	Areas f	rom re n dera	ot measu te to lig chamber wo light	red. Ligght heat and extended tongitud	ht rust checking ending fo hal goug	oits and beginni rward to es begin	stanins ng (appr (approx ning .75	en- ox) ) 12.00"
Inspectant forward or ward or	om 28.70 ng powde from re l of ord	marks: Of to 29 or chamber face gin of and ex	Areas f 2.70" we er. Mod of tube rifling	rom re n dera in for	te to light ward to	red. Light heat and external congitude origin at	the rust checking ending fo mal goug 5.00 0	pits and beginning rward to es begin clock	stanins ng (appr (approx ning .75 (ouge on	en- ox) 12.00" " rear- edge of
Inspect and free circlin 12.00" forward on land ar	om 28.70 ng powde from re l of origin t 5:00	marks: O' to 29 or chamber face gin of and ex	Areas for the control of tube rifling tending	rom re n lera in for	te to light ward to 6.25" for	red. Light heat and extended origin at ward of co	the rust checking ending fo mal goug 5.00 0	pits and beginning rward to es begin clock	stanins ng (appr (approx ning .75 (ouge on	en- ox) ) 12.00"
Inspectant forward or land ar Gomer	tion Reson 28.70 mg powder from re- l of origin to 5:00 ( throug,	marks: O" to 20 or chamber face gin of and ex O'clock, out tub PED	Areas f 2.70" we er. Mod of tube rifling tending beginn e. Tife	rom re n lera in for ing c res	te to light ward to .25° for maining	red. Light heat and extended origin at ward of co	checking checking for the checking for t	pits and beginning rward to es begin clock	stanins ng (appr (approx ning .75 (ouge on	en- ox) 12.00" " rear- edge of
Inspectant forward or land ar	tion Recom 28.74 ng powder from re l of ord f origin t 5:00 (	marks: O" to 20 or chamber face gin of and ex O'clock, out tub PED	Areas f 2.70" we er. Moo of tube rifling tending beging	rom re n lera in for ing c res	te to light ward to .25" for maining	red. Linght heat and external congitude origin at ward of const.	the rust checking anding found goue 5.00 0' origin an	pits and beginning rward to es begin clock. d extend	stanins ng (appr (approx ning .75 (ouge on	en- ox) 12.00" " rear- edge of

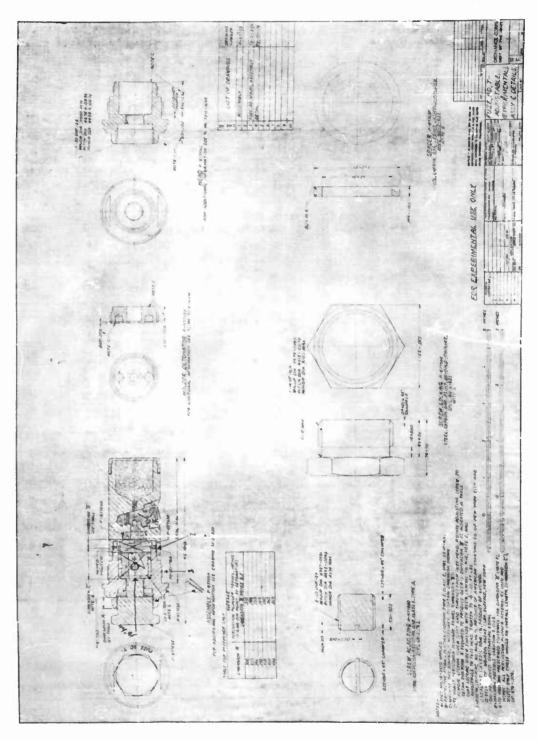
\_..ge 1 of 2

The second		SPOTZ 651		ME"	TEOROLOGICAL SE	RVICE		DATE 10	April 1957		
	SURFACE	15	5mm Ho	witzer		-	Allen				
1	MAXIMUM	TEMPERAT	URE		MINIMUM TEMPERA	TURE		MEAN TEMPERATURE			
	TIME	WIND VEL.	WIND DIR-		WEATHER	VISIBILITY	TEMP.	SEA LEVEL PRESSURE	REL. HUM.	RELATIVE	
ı		и. Р. Н.		AZ.	WEATHER		of	IN. OF HG.	5	DENSITY	
	0945	11	WM	110	Clear	15+	53.1	30.07	ելել	1.053	
	1005	12	W	100	(Sotd) Thin Clds.	15+	52.6	30.07	40	1.035	
	1016	11	WSW	070	(Setd) Thin Clds.	15+	52.8	30.07	39	1.034	
	1025	8	WSW	070	(Sctd) Thin Clds.	15+	52.5	30,06	40	1.034	
	1030_	9	MSM	070	(Sctd) Thin Clds.	15+	52.6	30.06	40	1.034	
,	1035	14	VISN	070	Sctd clds	15+	53.5	30.06	39	1.032	
	1105	10	SSW	025	Sotd clas	15+	55.0	30.06	37-	1.029	
3	1115	8	SSW	025	Sotd clds	15+	55.1	30.06	38	1.029	
	1120	15	WSW	070	Setd clds	15+	55.6	30.06	36	1.028	
	1130	10	WSW	070	Sctd clds	15+	55 •4	30 <b>.</b> 06	36	1.028	
	1140	10	MSW	070	Sctd clds	15+	55.4	30.05	37	1.028	
	1143	ป₊	W	100	Sotd clds	15+	55.1	30.05	38	1.029	
	11/15	12	ma	155	Setd elds	15+	55,2	30.05	38	1.028	
	1147	10	NNT	155	Setd clds	15+	55 1	30.05	36	1.028	
	1150	18	NW	140	Sotd clds	15+	55.5	30.05	35	1,028	
	1152	10	MAL	11,0	Setd clds	15+	55.0	30,05	35	1.029	
	1155	8	WINTY	110	Sotd clds	15+	55.2	30,05	3/1	1.028	
	1353	9	WMW	110	Sotd clds	15 <del>?</del>	57.1	30,02	35	1.023	
	1400	10	М	100	Sotd olds	15+	57.2	30.02	33	1.023	
	1405	8	W	100	Sotd clds	15+	57.4	30.02	34	1.023	
1	1406	9	W	100	Sctd olds	15+	57.2	30.02	33	1.023	
	1411	12	WNW	110	Sotd olds	15+	56.8	30.02	32	1.024	
	1420	18	MIN	110	Sotd clds	15+	56.6	30,02	31	1.025	
	1/155	1/4	WN:	110	Sotd olds	15+	56.7	.30.02	30	1,025	
	1424	12	WWW	110	Setd clds	15+	56.5	30.02	31	1.025	

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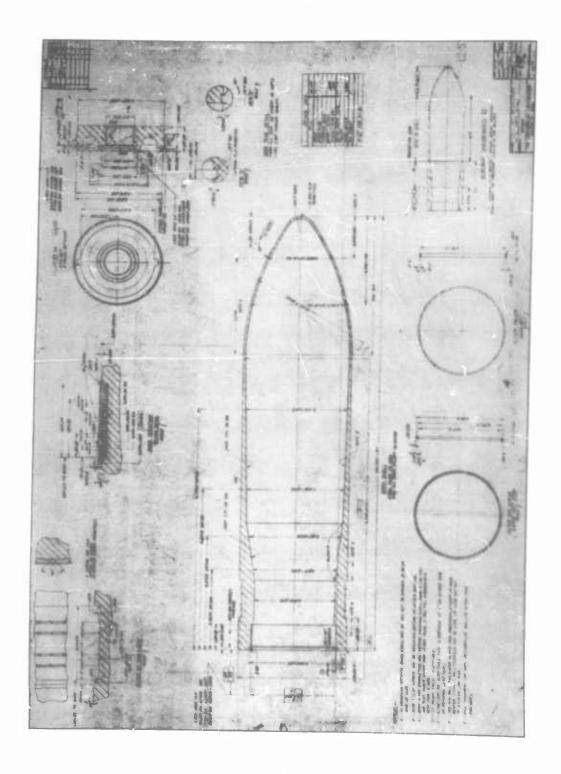
SURFACE DATA 155mm Howitzer Mr. Allen												
				Howitz			WY			·		
	MAXIMUM	TEMPERATU	YE.		MINIMUM TEMPERA	TURE		MEAN TEMPERATURE				
	TIME	WIND WIND DIR- VEL. (From)			WEATHER	VISIBILITY	TEMP.	SEA LEYEL PRESSURE	REL. HUM.	RELATIVE		
		M.P.H.		AZ.			OF	IN. OF HG.	7	DENSITY		
_	11/26	Jı.	TANK	110	Sotd olds	15	57.1	30.02	31	1.02		
_	1/30	10	WMW	110	Sotd olds	15	56.7	30.02	32	1.02		
	1540	10	WAR	110	Setd clds	15	56.8	30.03	32	,1.02		
	15/12	1,	WIN	110	Setd clds	15	57.0	30.03	32	,1,02		
_	15/18	12	VANY	110	Setd clds	15	56.4	30.03	314	1.02		
_	1550	ปเ	WNW	110	Sotd clds	15	56.2	30.03	34	, 1.02		
	1552	5	WINW	110	Setd clds	15	56.0	30.03	35	1.02		
_	1555	13	WINW	110	Setd olds	15	56.1	30.03	34	1.02		
	1557	1/4	MMA	110	Sotd olds	15	56.5	30.03	34	1.02		
_	1559	9	WNW	110	Setd olds	15	56.7	30.03	35	1.02		
	1601	12	WWW	110	Sctd clds	15	56.8	30.03	36	1.02		
	160 2	10	WNW	110	Sotd olds	15	56 Ji	30.03	37	1.02		
	1604	10	WNW	110	Setd olds	15	56.7	30.03	37	1.02		
		120			1							
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	855 5 OCT 45 Y SPOTZ 651		11 April 1957							
			5mm Ho			Mr	. Allen			
MAXIMUM TEMPERATURE				MINIMUM TEMPE	RATURE .		MEAN TEMPERATURE			
TIME	WIND VEL.	WIND DIR. (From)		WEATHER	VISIBILITY	TEMP.	SEA LEVEL PRESSURE IN. OF MG.	REL. HUM.	RELATIVE DENSITY	
1000		SSW	025	Clear	12	55.0	30.20	29%	1.034	
1005	5	SSW	020	Clear	15	55.2	30.19	30%	1.033	
1008	9	s	010	Clear	<b>1</b> 5	55 •3	30.19	29%	1.034	
1012	7	S	010	Clear	15	55.4	30.19	30%	1.034	
1015	4	s	010	Clear	15	55.2	30.19	31%	1.033	
1020	11	S	010	Clear	15	55•3	30.18	28%	1.034	
1025	7	S	010	Clear	15	55.6	30 <b>.1</b> 8	27%	1.033	
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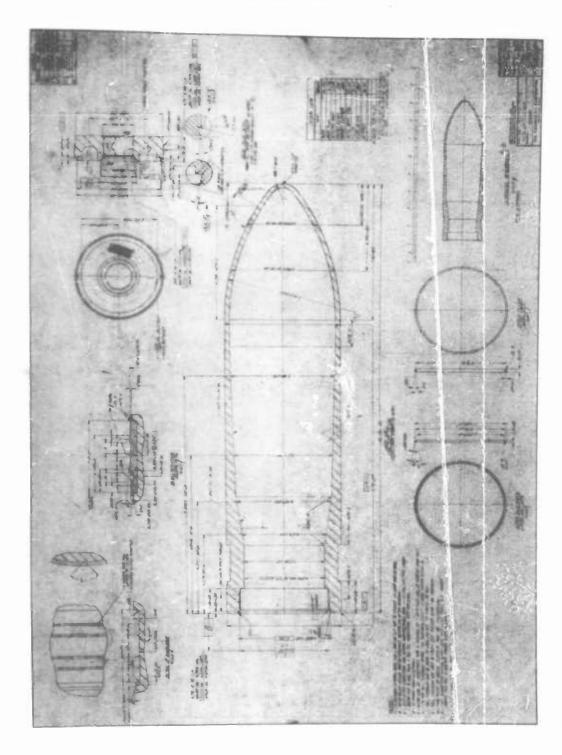
F-1 CONFIDENTIAL

## CONFIDENTIAL



F-2
CONFIDENTIAL

# CONFIDENTIAL



CONFIDENTIAL

# UNCLASSIFIED

UNCLASSIFIED